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Engineering Evaluation and Cost Analysis (EE/CA)

Non-Time-Critical Removal Action for Soil Gas

Site 1
Former Drum Marshalling Area

Naval Weapons Industrial Reserve Plant
Bethpage, New York

Mid-Atlantic Division
Naval Facilities Engineering Command

Contract Number N62472-03-D-0057
Contract Task Order 002

SEPTEMBER 2009

TETRA TECH NUS, INC.

ENGINEERING EVALUATION AND COST ANALYSIS (EE/CA)

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SITE 1
FORMER DRUM MARSHALLING AREA

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP)
BETHPAGE, NEW YORK

Submitted to:
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Mid-Atlantic
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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN)
Contract No. N62472-03-D-0057
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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
AOC	Area of Concern [sometimes called Area of Contamination by New York]
APU	air purifying unit
ARAR	Applicable or Relevant and Appropriate Requirement
AS	air sparge / sparging
AS/SVE	air sparge / sparging [in combination with] soil vapor extraction
AST	aboveground storage tank
bgs	below ground surface
CAMU	Corrective Action Management Unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
cfm	cubic feet per minute
CFR	Code of Federal Regulations [e.g., CFR Title 40, Section 300 (40 CFR 300)]
CLEAN	Comprehensive Long-Term Environmental Action Navy
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COC	Chemical of Concern
CTO	Contract Task Order
CVOC	chlorinated volatile organic compound
CWA	Clean Water Act of 1972
DPT	direct-push technology
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
ERP	Environmental Restoration Program [formerly known as Installation Restoration Program [IRP])
FS	Feasibility Study
Foster Wheeler	Foster Wheeler Corporation
GAC	Granular activated carbon
GOCO	Government-Owned and Contractor-Operated [facility]
HI	Hazard Index
HNUS	Halliburton NUS, Inc.
HRS	Hazardous Ranking System
HSWA	Hazardous and Solid Waste Amendments of 1984
IAS	Initial Assessment Study
IRP	Installation Restoration Program
kg	Kilogram
L	Liter
LUCs	land use controls
M	Million
m^3	cubic meter
MCL	Maximum Contaminant Level

µg	Microgram
µg/m^3	micrograms per cubic meter
mg	Milligram
mg/kg	milligrams per kilogram
msl	[above] mean sea level
NAVFAC	Naval Facilities Engineering Command
Navy	U.S. Navy
NCP	National Oil and Hazardous Substances Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NFA	No Further Action
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
Northrop Grumman	Northrop Grumman Corporation
NPL	National Priority List
NTCRA	non-time-critical removal action
NWIRP	Naval Weapons Industrial Reserve Plant
NY	New York
NYS	New York State
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	operation and maintenance
OM&M	O&M and monitoring
OU	Operable Unit
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PA	Preliminary Assessment
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	Tetrachloroethene
PEL	Permissible Exposure Limit
PRAP	Proposed Remedial Action Plan
PV	present value
RA	Remedial Action
RD	Remedial Design
RAO	Removal Action Objective [or Remedial Action Objective]
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act of 1976
REL	Recommended Exposure Limit
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Value
SARA	Superfund Amendments and Reauthorization Act of 1986
SCG	Standards, Criteria, and Guidelines [these are "ARARs" for NYS]
SI	Site Investigation
SSD	sub-slab depressurization system
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SVPM	soil vapor pressure monitor

SWMU	Solid Waste Management Unit
TBC	To Be Considered
TCA	1,1,1-trichloroethane
TCLP	toxicity characteristic leachate procedure
TCR	Target Carcinogenic Risk
TCRA	time-critical removal action
TCE	Trichloroethene
Tetra Tech	Tetra Tech NUS
TLV	Threshold Limit Value
TSD	Treatment, Storage, and Disposal [facility]
TWA	time-weighted average
U.S.	United States
USC	U.S. Code [e.g., USC Title 10, Section 2701 (10 USC 2701)]
UST	underground storage tank
VOC	volatile organic compound

1.0 INTRODUCTION

This Engineering Evaluation/Cost Analysis (EE/CA) for Site 1 – Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, Long Island, New York (NY) (Figures 1-1, 1-2, and 1-3), was prepared by Tetra Tech for Naval Facilities Engineering Command (NAVFAC) – Mid-Atlantic under the U.S. Navy's *Comprehensive Long-Term Environmental Action Navy* (CLEAN) Contract No. N62472-03-D-0057, Contract Task Order (CTO) 002.

NWIRP Bethpage was a government-owned, contractor-operated (GOCO) facility owned by the Navy and operated by Northrop Grumman Corporation (Northrop Grumman). This work is part of the U.S. Navy's Environmental Restoration Program (ERP), which is designed to identify contamination resulting from historical operations or releases at U.S. Navy (Navy) lands and facilities, and to institute removal or remedial actions as necessary. The Navy has determined that a non-time-critical removal action (NTCRA) may be appropriate to address volatile organic compound (VOC)-impacted soil vapor east of Site 1. This document is issued by the Navy, lead agency responsible for the NTCRA at Site 1. The New York State (NYS) Department of Environmental Conservation (NYSDEC) provides regulatory oversight.

A summary of historical activities, investigations, and documents associated with Site 1 is provided in Section 2.2. The VOC (i.e., chlorinated VOC [CVOC]) contamination at Site 1 resulted from historical use and releases of chlorinated solvents. The CVOCs in groundwater and soil were previously treated via air sparge (AS) and soil vapor extraction (SVE) technologies (AS/SVE) from 1998 to 2002 (Foster Wheeler Environmental Corporation [Foster Wheeler], 2001a, 2001b, and 2003). Concentrations of CVOCs in groundwater were reduced below cleanup levels; however, residual VOCs adsorbed to soil remained above cleanup levels, and were to be addressed further by natural attenuation processes (Navy, 2008).

The Navy conducted additional studies to gain a better understanding of how the CVOCs may migrate through the unsaturated vadose zone to occupied buildings in proximity to the site. Based on the new findings, the Navy determined that CVOC-impacted soil gas, which could cause potential vapor intrusion issues, migrated eastward into the residential neighborhood as far as 10th Street (Navy, 2008; Tetra Tech, 2008a, 2008b, and 2009).

After ascertaining the extent of the soil gas migration and collecting data at residences within the impacted area, the Navy conducted a time-critical removal action (TCRA) from February through May 2009 to address the indoor vapor intrusion issues in affected residences (Navy, 2009). Exposure pathways to soil vapor were removed by sealing sub-grade surfaces and openings (e.g., sump pump, pipes and electrical conduits, etc.). Air purifying units (APUs) were installed as an interim measure to address impacted-indoor air and sub-slab depressurization systems (SSDs) were installed in several

homes to minimize soil vapor intrusion potential (lowering sub-slab air pressure relative to indoor air pressure).

This EE/CA will develop, evaluate, and recommend an NTCRA alternative to expedite and/or complete long-term risk mitigation for current and future residents potentially exposed to CVOC-impacted-soil vapor.

1.1 REGULATORY BACKGROUND

The stages for ERP site investigations and actions typically managed under the (1) Resource Conservation and Recovery Act of 1976 (RCRA)[1] and/or (2) Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)[2] are tabulated below (NAVFAC, 2006). Cleanup of contaminated sites are normally governed by either RCRA or CERCLA depending on such factors as the source and cause of the contamination, the status of the installation as either a National Priority List (NPL; e.g., Superfund) site or a non-NPL site, and whether the installation has sought or is seeking a RCRA permit for managing hazardous wastes.

CERCLA Response Actions and RCRA Corrective Actions at Federal Facilities (NAVFAC, 2006)

CERCLA Response Action	*RCRA Corrective Action*
Preliminary Assessment/Site Inspection (PA/SI) • Preliminary Assessment (PA), formerly known as the Initial Assessment Study (IAS). • Hazard Ranking System (HRS) Scoring. • Site Inspection (SI).	**RCRA Facility Assessment (RFA)** • Preliminary Review. • Visual Site Inspection. • Sampling Visit.
* **Removal Action** • Emergency Removal Actions • TCRAs • NTRCAs (evaluated in EE/CA)	* **Interim Measures** • Interim Remediation. • Temporary Fixes. • Alternate Water Supplies.

[1] RCRA as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), the Federal Facility Compliance Act of 1992, and the Land Disposal Program Flexibility Act of 1996. U.S. Code (USC) Title 42, Section 6901 (42 USC 6901) et seq. RCRA Subtitle C (Hazardous Waste Regulations; Code of Federal Regulations [CFR] Title 40, Parts 260 through 279 [40 CFR 260-279]) establishes a system for controlling hazardous waste from the time it is generated until its ultimate disposal (from "cradle to grave").

[2] CERCLA as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and implemented by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The NCP (40 CFR 300) was originally established to respond to oil spills. However, following issuance of the Clean Water Act of 1972 (CWA), the NCP was broadened to include actual and potential hazardous substance releases. In 1980, the NCP was further broadened by CERCLA to include removal actions at hazardous waste sites.

CERCLA Response Actions and RCRA Corrective Actions at Federal Facilities (NAVFAC, 2006)	
CERCLA Response Action	***RCRA Corrective Action***
Remedial Investigation (RI) • Site-Specific Data Collection. • Source Characterization. • Contamination Characterization. • Waste Mixtures, Media Interface Zones. • Hydrogeological and Climate Factors. • Risk Assessment. • Potential Routes of Exposure. • Extent of Migration.	**RCRA Facility Investigation (RFI)** • Background Data Review. • Environmental Setting Investigation. • Sources Characterization. • Contamination Characterization. • Potential Receptors Characterization.
Feasibility Study (FS) • Define Objectives and Nature of Response. • Develop Alternatives. • Conduct Detailed Analysis of Alternatives.	**Corrective Measures Study (CMS)** • Identify and Develop Alternatives. • Evaluate Alternatives. • Justify & Recommend Corrective Measure.
Remedy Selection • Select Remedy Which Meets Nine NCP Criteria. • Proposed Remedial Action Plan (PRAP). • Record of Decision (ROD).	**Remedy Selection** • Select Remedy that Abates Threat to Human Health and the Environment.
Remedial Design/Remedial Action (RD/RA) • Design Remedy. • Perform Remedial Action. • Perform Operations and Maintenance and Monitoring.	**Corrective Measures Implementation (CMI)** • Develop Implementation Plan, Program, and Community Relations Plan. • Corrective Measures Design. • Construction and Implementation.

Note: Removal Actions and Interim Measures may be implemented at any point during the Response Action or Corrective Action

When NWIRP Bethpage was operational, it was considered to be a large quantity generator of hazardous waste and was classified as a Treatment, Storage, and Disposal (TSD) facility for storage of hazardous wastes beyond 90 days. Accordingly, NWIRP Bethpage operated under a federal HSWA permit (i.e., "RCRA permit") in which the Navy was identified as the property owner and Northrop Grumman was listed as the operator. In addition, NWIRP Bethpage operated under an NYSDEC "373 permit" (*Permit to Operate a Hazardous Waste Management Facility*; NY Codes, Rules, and Regulations [NYCRR] Title 6, Part 373 [6 NYCRR 373]). After NWIRP operations ceased, the TSD portion of the 373 permit was terminated, but corrective action components remained. As part of the property transfer to Nassau County, NY, the 373 permit boundary was modified to eliminate the transferred property.

The remaining NWIRP Bethpage property retains the RCRA permit, with requirements limited to corrective action components only. NYSDEC also classifies NWIRP Bethpage as an "Inactive Hazardous Waste Disposal Site" per 6 NYCRR 375, which references and closely parallels the NCP. NWIRP

Bethpage is not on the NPL. The Navy ERP manages the remaining contaminated sites under the CERCLA framework.

Both CERCLA and RCRA share the goal of protecting human health and the environment, and any procedural differences between CERCLA and RCRA should not substantially affect the outcome of cleanup. Therefore, environmental cleanup implemented under CERCLA response obligations will be protective of human health and the environment such that cleanup of releases shall obviate the need for further corrective action under RCRA. With respect to releases of hazardous waste, RCRA shall be considered an applicable or relevant and appropriate requirement (ARAR) in accordance with CERCLA Section 121 (i.e., 42 USC 9621 implemented by 40 CFR 300.430).

The NCP defines a removal action as the "cleanup or removal of released hazardous substances from the environment; such actions as may be necessary to monitor, assess, and evaluate the threat of release of hazardous substances; the disposal of removed material; or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare of the United States or to the environment, which may otherwise result from a release or threat of release. The term includes, in addition, without being limited to, security fencing or other measures to limit access... and enforcement activities related thereto."

A TCRA is performed when the lead agency determines an immediate risk to public health or welfare of the U.S. or environment, whereas an NTCRA is performed when there is an imminent, but not an immediate, threat, and "...a planning period of at least 6 months exists before onsite activities must be initiated (40 CFR 300.415[b][4])." "NTCRAs may be interim or final actions; they may be the first and only action at a site, or one of a series of planned response actions (EPA, 1993)." Considering the TCRA implemented at Site 1 in February through May 2009 (see Section 2.2.2) addressed immediate risk from exposure to CVOC-impacted soil vapor, the removal action developed herein is not time-critical.

The NCP requires the lead agency to conduct an EE/CA to evaluate NTCRA alternatives. The goals of an EE/CA are to satisfy environmental review and Administrative Record requirements for removal actions, and to provide a framework for evaluating and selecting the removal action alternative technologies (EPA, 1993).

Community involvement requirements for NTCRAs include making the EE/CA available for public review and comment for a period of 30 days. An announcement of the public comment period is required in a local newspaper. Written responses to significant comments would be provided in a responsiveness summary to be attached to the Navy's Action Memorandum, and would be included in the Administrative Record for NWIRP Bethpage. Information in the Administrative Record can be accessed by contacting the following Public Affairs Officer at (757) 445-8732 x3096:

Public Affairs Officer, Code 09PA
Naval Facilities Engineering Command Mid-Atlantic
9742 Maryland Ave., Bldg. A-81
Norfolk, Va. 23511

In addition, the Navy maintains a public repository, which includes supporting technical documents and correspondence related to Site 1 and NWIRP Bethpage, at the following location:

Bethpage Public Library
47 Powell Avenue
Bethpage, NY 11714
(516) 931-3907

1.2 PURPOSE AND OBJECTIVES

This EE/CA has been prepared in accordance with the EPA (1993) guidance entitled *Superfund – Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA.* When the NTCRA is "...one of a series of response actions, where a completed RI is or will be available, and where the nature and extent of contamination and the risk presented by the site have or will be determined, ...the EE/CA would be similar to a Focused FS, concentrating on the analysis of perhaps two or three appropriate alternatives and providing reference to existing information on the nature and extent of contamination and risks." A comparison of developed removal alternatives is presented herein based on their technical feasibility, ability to protect human health and the environment, ability to prevent the potential release of hazardous chemicals or substances, and cost. Submittal of this document fulfills the requirements for planning NTCRAs as defined by the NCP.

The objective of the NCTRA at Site 1 is to contain, control, and remove impacted soil vapor to reduce the potential risk to human health. The removal action alternatives evaluated herein are as follows:

- Alternative 1 – No Action
- Alternative 2 – Long-Term Operation and Maintenance (O&M) and Monitoring (OM&M) of Engineering Controls
- Alternative 3 –SVE Containment System, Engineering Controls, and OM&M

1.3 REPORT ORGANIZATION

This EE/CA was prepared to include the elements specified in EPA (1993) guidance, and is organized as shown in the Table of Contents. Tables and figures are provided at the end of the document.

2.0 SITE HISTORY AND CHARACTERIZATION

This section provides a summary of background information for NWIRP Bethpage and Site 1 - Former Drum Marshalling Area. Additional information can be found in the Halliburton NUS (HNUS) (1992) *RI for Sites 1, 2, and 3*; HNUS (1993) *Phase 2 RI for Sites 1, 2, and 3*; and the Tetra Tech (2008d) *Five-Year Review for Sites 1, 2, and 3 at NWIRP Bethpage.* This section also summarizes previous environmental investigations and actions that occurred at Site 1.

2.1 FACILITY INFORMATION

2.1.1 Facility Location

NWIRP Bethpage is located in east-central Nassau County, Long Island, NY, approximately 30 miles east of New York City (Figure 1-1). The Navy's property once totaled approximately 109 acres, and was a GOCO facility formerly operated by Northrop Grumman until September 1998. In 2002, approximately 4 acres were transferred to Nassau County. Another 96 acres were transferred to the county in April 2008. The remaining 9 acres and access easements were retained by the Navy to continue remedial efforts at ERP Site 1 and ERP Site 4 – Former Underground Storage Tanks (USTs) (also know as Area of Concern [AOC] 22; currently under investigation) (Figures 1-2 and 1-3). The 9-acre parcel of NWIRP is bordered on the east by the residential neighborhood and on the north, south, and west by county property. Access to the facility is from South Oyster Bay Road to the west.

2.1.2 Facility History

NWIRP Bethpage was established in 1941. Its primary mission was the research prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. The facility included four plants used for assembly and prototype testing; a group of quality control laboratories, two warehouse complexes (north and south), a salvage storage area, groundwater recharge basins, the Industrial Wastewater Treatment Plant, and several smaller support buildings. In 1998, manufacturing operations ended at the facilities.

Since 1998, activities occurring at the facility included facility maintenance (security and mowing), storage of Nassau County impounded vehicles, and environmental investigations and/or remediation of soil, groundwater, and soil vapor. Approximately 100 acres (including ERP Site 2 – Recharge Basins and ERP Site 3 – Salvage Storage Yard) were transferred to Nassau County in 2002 and 2008. The Navy retains the remaining 9 acres pending completion of remedial activities at Sites 1 and 4. Even though the Navy will retain ownership of this property, the Navy has leased the 9-acre parcel to Nassau County.

2.1.3 Facility Setting

2.1.3.1 Climate and Meteorology

NWIRP Bethpage is located in an area classified as a humid-continental climate. Its proximity to the Atlantic Ocean and Long Island Sound add maritime influences to the classification (National Oceanic and Atmospheric Administration [NOAA], 1982). The climate is warm during summer when temperatures tend to be in the 70s and cold during winter when temperatures tend to be in the 30s (IDcide.com, 2009). The warmest month of the year is July with an average maximum temperature of 81 degrees Fahrenheit (°F), while the coldest month of the year is January with an average minimum temperature of 24 °F (Wantagh Cedar Creek Weather Station located 6.6 miles from Bethpage; IDcide.com, 2009). Temperature variations between night and day tend to be limited during summer with a difference that can reach 15 °F, and fairly limited during winter with an average difference of 13 °F. The annual average precipitation at Bethpage is approximately 43 inches. Rainfall is fairly distributed throughout the year. The wettest month of the year is April with an average rainfall of 4 inches.

2.1.3.2 Surface Features

NWIRP Bethpage is located on a relatively flat, featureless, glacial outwash plain. The site and nearby vicinity are highly urbanized. Subsequently, most of the natural physical features have been reshaped or destroyed. The topography is relatively flat with a gentle slope toward the south. Elevations range from greater than 140 feet above mean sea level (msl) in the north to less than 110 feet msl at the southwest corner.

2.1.3.3 Ecological Setting

NWIRP Bethpage is an industrialized area located within urban and suburban residential settings. There are no identified ecological habitats at NWIRP Bethpage, and no nearby habitats have been impacted by NWIRP Bethpage historical site operations.

2.1.3.4 Geology, Hydrogeology, and Hydrology

NWIRP Bethpage is underlain by approximately 1,100 feet of unconsolidated sediments that overlie crystalline bedrock (Isbister, 1966). The unconsolidated sediments consist of four distinct geologic units: (in descending order) Upper Glacial Formation, Magothy Formation, Raritan Clay, and Lloyd Sand Formation. The 30- to 45-foot-thick Upper Glacial Formation consists chiefly of coarse sands and gravels. The Upper Magothy Formation consists chiefly of coarse sands to a depth of approximately 100 feet, below which finer sands, silts, and clay predominate. The clay is common but laterally discontinuous; no individual clay horizon of regional extent underlies the facility. The 100- to 150-foot-

thick Raritan Clay underlies the Magothy Formation at a depth of approximately 700 feet. The underlying Lloyd Sand Formation is approximately 300 feet thick.

Most of Long Island is bisected by an east-west-trending regional groundwater divide. NWIRP Bethpage occupies an area of recharge, lying to the south of the divide. Groundwater is in communication between the Upper Glacial and Upper Magothy Formations beneath the facility, and may be considered a common unconfined aquifer, which is encountered at approximately 40 feet below ground surface (bgs). The glacial deposits are characterized by a high primary porosity (exceeding 30 percent) and permeability. The high permeability of the glacial deposits allows for the rapid recharge of precipitation to the underlying Magothy (Isbister, 1966; McClymonds and Franke, 1972). The number and thickness of clay lenses increase with depth in the Magothy Formation; however, the horizontally discontinuous nature of these units prevents any one of them from functioning as an aquitard or semi-confining unit.

Groundwater beneath the site flows in a generally southward direction toward the Atlantic Ocean. The horizontal hydraulic gradient and groundwater velocity in the unconfined common aquifer across the facility average 5.3 feet per mile and 0.3 foot per day, respectively (HNUS, 1993). Subtle vertical hydraulic gradients occur in a downward direction. Groundwater in the deeper portion of the Magothy is the primary source of potable water in Nassau County. Former NWIRP production wells (now abandoned) set in the Magothy yielded 1,200 gallons per minute. Northrop Grumman operates production wells and a groundwater containment system south of NWIRP Bethpage. The production wells and groundwater containment system operated with a combined flow rate of 3,800 gallons per minute.

2.1.4 Facility Previous Investigations

The 1986 IAS at NWIRP Bethpage identified three areas with VOC, semivolatile organic compound (SVOC), and/or inorganic contamination that potentially posed a threat to human health and the environment (Naval Energy and Environmental Support Activity [NEESA], 1986): Site 1 – Former Drum Marshalling Area, Site 2 – Recharge Basin Area, and Site 3 – Salvage Storage Area. The IAS also concluded that transformers possibly containing polychlorinated biphenyls (PCBs) may have been stored at these sites.

A facility-wide RI was performed from 1991 to 1993 to characterize the sites (HNUS, 1992 and 1993). The RI recommended an FS to develop and evaluate remedial alternatives to address potential unacceptable human health risk from exposure to contaminants in soil at Sites 2 and 3, and soil and groundwater at Site 1. Federal and state groundwater criteria, soil cleanup guidelines for the protection of groundwater, site background conditions, and risk-based criteria were used to develop preliminary remediation goals (HNUS, 1994).

A ROD was signed in 1995 to document the path forward, selected remedies, and cleanup levels for the sites (Navy, 1995). The major components of the selected remedies were soil excavation (Sites 2 and 3); soil cover (Site 2); land use controls (LUCs) (all sites); and the construction, operation, and maintenance of an AS/SVE system (Site 1). The AS/SVE system was installed and seasonably operated from 1998 through 2002. By 2002, the remedial activities for Sites 2 and 3 were completed, and VOC concentrations in groundwater were reduced to target concentrations at Site 1.

The USTs at Site 4 (AOC 22) were reportedly removed in the early 1980s. However, soil and groundwater sampling efforts in the area in 1997 and 1999 identified petroleum contamination, including free-phase product on the water table. A pilot-scale technology study was conducted at the site that included biodegradation, soil washing, and chemical oxidation.

Metal and PCB contamination in soil and groundwater remain at Site 1 and petroleum contamination in groundwater is still under investigation at Site 4. A second ROD was signed in 2003, specifying that groundwater contamination at Sites 1 and 4 would be addressed collectively as Operable Unit 2 (OU 2) along with groundwater contamination from nearby non-Navy sources (Northrop Grumman and Hooker Ruco NPL sites) (Navy, 2003). Based on the finding that PCB contamination was more extensive than originally understood, the Navy is reevaluating potential remedial alternatives for the metals and PCB-contaminated soils at Site 1.

2.2 SITE INFORMATION

Site 1 is located east of the former Manufacturing Plant No. 3 (Figures 1-2 and 1-3). The 4-acre-site is relatively flat with a 4-foot vegetated windrow located along the eastern end of the site, and is mounded on the north (buried, abandoned sanitary settling tank [AOC 23]). The site is enclosed by a facility perimeter fence along the east and interior facility fences along the north, south, and west. The interior fence was installed in 1998 as an interim measure to restrict exposure of facility personnel to areas with residual soil contamination. The area bounded by this fence is lightly vegetated soil and includes AOCs 23, 30, and 35. The structures and features at the site (e.g., former drum storage pad) were demolished and removed in June 2009. The Site is covered currently with lightly vegetated soil.

Current use of Site 1 is limited and consists of periodic mowing of vegetation within the fenced in portion of the site (two to three times per year) and infrequent maintenance of the perimeter fence. Unfenced portions of Site 1 are used for vehicular traffic around Plant No. 3 and a security patrol of the facility. No resources are available at Site 1.

2.2.1 Site Description and History

Site 1 originally consisted of two former drum marshalling pads that were used to store drums containing waste from operations at Plant No. 3 and potentially other sources at the facility. The waste drums

reportedly contained chlorinated and non-chlorinated solvents, and liquid cadmium and chromium wastes. Transformers and PCB-filled autoclaves were also stored at the site. In addition, underlying most of Site 1 is approximately 120 abandoned cesspools that were designed to discharge sanitary wastewaters from Plant No. 3. These cesspools were approximately 10 feet in diameter and 16 feet deep. Based on field observations, the cesspools are filled with soil. It is possible that non-sanitary wastes may have been discharged through this system. The drum marshalling areas and extent of the leach field were the original extent of Site 1.

In 2005, because of proximity and similar nature of contamination, the definition of Site 1 was expanded to include the following AOCs (see Figure 1-3):

- AOC 34-07 – Drywell
- AOC 20-08 – Drywell
- AOC 23 – Former Above Ground Storage Tanks (ASTs) / Settling Tanks
- AOC 30 – Storage Sheds
- AOC 35 – Former Sludge Drying Beds

The drywells (AOCs 34-07 and 20-08), which were removed in 1998, were part of a storm water management system for this area. PCB fluids likely entered the system through floor drains in Plant No. 3 and then entered underlying soils through permeable drywell bottoms.

The former ASTs (AOC 23), storage sheds (AOC 30), and sludge drying beds (AOC 35) are three related areas at the northern end of Site 1. AOCs 23 and 35 were used for sanitary waste treatment and included solids settling and dewatering activities, respectively. Sanitary wastewater from Plant No. 3 was discharged to AOC 23, which was used to separate solid and liquid wastes. The liquids from AOC 23 were discharged into a series of cesspools located throughout Site 1. The solids from AOC 23 were collected and dewatered at AOC 35. Based on the distribution of contamination throughout this area, non-sanitary wastes may have also entered these units. The exact use of AOC 30 is uncertain, but based on proximity and the type of contaminants found at the AOC (metals), its use was likely related to AOC 23 and 35 operations. The upper portion of the settling tank (AOC 23) and the sludge drying beds (AOC 35) were demolished and removed from the site in June 2009.

2.2.2 Previous Investigations and Actions

Site 1 was first identified as a potential source of contamination in the 1986 IAS, and contamination was confirmed during the RI. A summary of investigations, events, and actions at Site 1 is provided in Table 2-1.

The 1995 ROD summarized what was at the time believed to be the nature and extent of contamination and identified where more data needed to be collected to further delineate the extent of contamination. The Remedial Action Objectives (RAOs) specified in the ROD included compliance with ARARs; prevention of human exposure to soil with contaminant concentrations above cleanup goals; prevention of contaminant-leaching from soil to groundwater at concentrations that could result in groundwater concentrations above cleanup levels; reduction, control, or elimination of contamination in site soils; and prevention of offsite contaminant migration. The selected remedy included additional sampling to support the RDs for soil and groundwater, excavation of arsenic- and PCB-contaminated soils, remediation of VOCs in soil and groundwater with an AS/SVE system, LUCs, provision for interim remedial measures, and administrative cost resolution with the local public water treatment plant.

The AS/SVE system to treat VOCs in soil and groundwater operated from 1998 to 2002. After the objectives of the AS/SVE system were met, the Navy recommended shut down and removal of the system. The NYSDEC concurred with this recommendation and the AS/SVE system was removed in 2003.

Remaining groundwater contamination from Site 1 (metals and PCBs) and Site 4 (petroleum compounds) is still under investigation along with Site 1 soil, while offsite groundwater is addressed under OU 2. Investigations are ongoing, and future actions will be performed considering other non-Navy potential sources of groundwater contamination (Bethpage Community Park, Northrop Grumman Plants 1 and 2, and the Hooker Ruco NPL site).

The 1995 ROD did not identify the soil gas migration in the conceptual site model or indoor air issues as a potential exposure scenario. This issue was identified by the Navy and NYSDEC, and subsequent planning and investigations followed. Soil gas investigations performed in 2008 and 2009 confirmed migration of CVOC-impacted soil gas to the east of the site (Tetra Tech, 2008a, 2008b, and 2009; see Section 2.2.3 below).

2.2.3 Current Conditions

2.2.3.1 Nature and Extent of Potential Contamination

PCBs were detected in soil samples collected at a depth of 65 feet bgs, which is approximately 15 feet below the water table. The actual bottom of the PCB contaminated soils has not been confirmed. Based on current data, greater than 38,000 cubic yards of PCB-contaminated soils (PCB concentrations greater than 1 milligrams per kilogram [mg/kg]) are present (Tetra Tech, 2008c). The Navy is evaluating other options to address the remaining PCB, metals, and polynuclear aromatic hydrocarbon (PAH) contamination in soil at Site 1.

The 1995 ROD did not identify soil gas migration as a pathway of potential concern. In January 2008, the Navy collected soil gas samples at the facility fence line at varying depths (Tetra Tech, 2008a, 2008b, and 2009). Trichloroethene (TCE), tetrachloroethene (PCE), and 1,1,1-trichloroethane (TCA) were detected in the soil gas at the facility fence line on the east side of Site 1 (approximately 70 feet from residential housing). The highest TCE concentrations were detected in the southeast area of Site 1. The maximum TCE concentrations and corresponding depths were as follows (Figure 2-1 and Appendix A):

- 19,000 micrograms per cubic meter ($\mu g/m^3$) at 7 feet bgs
- 180,000 $\mu g/m^3$ at 20 feet bgs
- 150,000 $\mu g/m^3$ at 50 feet bgs

For the protection of the residential adult and child, the initial screening value from the NYS Department of Health (NYSDOH) (2006) guidance for TCE-impacted soil gas (i.e., sub-slab soil vapor) is 250 $\mu g/m^3$. The initial screening value for TCE-impacted indoor air is 5 $\mu g/m^3$). TCE concentrations above 250 $\mu g/m^3$ directly below sub-grade structures may create vapor intrusion issues given a route of entry and other conducive conditions. For reference, the following federal criteria and guidelines for exposure to TCE-impacted indoor air are provided below (National Institute for Occupational Safety and Health [NIOSH], 2009; EPA, 2009):

- The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for general industrial workers is 537,000 $\mu g/m^3$ (time-weighted average [TWA] for an 8-hour exposure [shift] [40-hour-week]; ceiling value at over 1,000,000 $\mu g/m^3$).

- The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for workers is 270,000 $\mu g/m^3$ (8-hour-TWA).

- The NIOSH Recommended Exposure Limit (REL) for workers is 134,250 $\mu g/m^3$.

- The EPA Regional Screening Level (RSL) for indoor air is 1.2 $\mu g/m^3$ and 6.1 $\mu g/m^3$ for residential and industrial exposures, respectively (based on a Target Carcinogenic Risk [TCR] of 1×10^{-6}).

A second phase soil gas investigation was recommended after analysis of the Phase I data. Additional sampling was conducted in October 2008 through January 2009, yielding the following conclusions (Tetra Tech, 2007, 2008a, 2008b, and 2009).

- TCE, PCE, and TCA represent the primary site chemicals of concern (COCs). Soil gas samples collected in January 2008 along the eastern border of Site 1 indicated maximum TCE, PCE, and TCA concentrations of 180,000 $\mu g/m^3$, 5,300 $\mu g/m^3$and 90,000 $\mu g/m^3$, respectively. Offsite soil gas sampling showed maximum concentrations of TCE at 89,000 $\mu g/m^3$, PCE at 5,000 $\mu g/m^3$, and TCA at 52,000 $\mu g/m^3$.

- The analytical results from the offsite soil vapor testing showed a substantial decrease in soil vapor concentrations from onsite samples. Continual decreases in soil vapor concentrations were observed over distance away from Site 1.

- Observed concentrations of TCE, PCE, and TCA above the NYSDOH sub-slab guideline values in shallow soil vapor are limited to the adjacent residential block, roughly bounded by Sycamore Avenue to the north, 10th Street to the east, and by Maple Avenue to the south.

Based on the data collected during this offsite soil gas investigation in the residential neighborhood, indoor air and sub-slab soil vapor testing was recommended to determine if soil vapor intrusion is a concern in residential homes. The follow-on sampling determined the affected houses based on indoor air concentrations. Subsequently, the Navy performed the TCRA to mitigate immediate risks in the affected residences.

2.2.3.2 Human Health Risk Summary

Residential exposure to metals and PCBs in groundwater at NWIRP Bethpage (surficial aquifer at approximately 50 feet bgs) under a potable use scenario (ingestion, dermal, and inhalation) would result in carcinogenic risk greater than 1×10^{-4} and non-carcinogenic risk Hazard Index (HI) greater than 1.0 (HNUS, 1994). Worker exposure to groundwater under a potable use scenario would also result in a carcinogenic risk greater than 1×10^{-4} and an HI of 0.5. Groundwater is being addressed separately as OU 2 at NWIRP Bethpage in conjunction with contamination from other non-Navy sources.

The vertical extent of PCB contamination in soil extends beyond the depth of groundwater at Site 1 (50 feet bgs) to at least 65 feet bgs (Tetra Tech, 2008c). The volume of PCB-contaminated soil (concentrations greater than 1 mg/kg) exceeds 38,000 cubic yards. Implementation of the final remedy for non-VOC contaminated soils at Site 1 has been delayed because of the finding of much higher volumes of impacted media than had been identified during the ROD. The Navy is evaluating options for addressing the non-VOC contaminated soil. This issue is not affecting the current protectiveness at the site, but future use of the site is limited until the residual contaminated soil can be addressed.

Except for soil gas migration and soil vapor intrusion, the contaminants in the soils at the NWIRP (under the current or in future scenarios) do not represent a significant, direct, non-carcinogenic risk to onsite workers or offsite residents (hazard index is less than 1.0). Likewise, incremental carcinogenic risks are not indicated for offsite residents under the current soil scenario (excess cancer risk less than 1×10^{-6}). However, carcinogenic risks to onsite workers (under the current and future soil scenarios) and offsite residents (under future soil scenarios) exceed an excess cancer risk of 1×10^{-6}. The risks do not, however, exceed an excess cancer risk of 1×10^{-4}.

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

The Removal Action Objectives (RAOs) are developed to provide guidelines for evaluating the removal action and assuring that the action complies with regulatory requirements (e.g., ARARs). This section presents the RAOs and the removal action scope, schedule, and associated statutory limits.

3.1 STATUTORY LIMITS ON REMOVAL ACTION

The NCP (i.e., 40 CFR 300.415) dictates statutory limits of $2 million and 12 months of EPA fund-financed removal actions, with statutory exemptions for emergencies and actions consistent with the removal action to be taken. However, the removal action evaluated in this EE/CA will not be EPA fund-financed. The Navy ERP does not limit the cost or duration of the removal action; nonetheless, cost-effectiveness is a recommended criterion for the evaluation of removal action alternatives.

3.2 REMOVAL ACTION SCOPE AND OBJECTIVE

3.2.1 Removal Action Objective

The RAOs for this NTCRA are as follows:

- Mitigate unacceptable risk to residents from exposure to CVOC-impacted indoor air via soil vapor intrusion.
- Prevent further offsite migration of CVOC-impacted soil gas.
- Capture soil gas that has migrated offsite with CVOC concentrations at levels indicative of unacceptable risk to residential receptors via soil vapor intrusion.

The NYSDOH (2006) *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* specifies a risk-based benchmark value for indoor air TCE concentrations at 5 $\mu g/m^3$ to be protective of both residential adults and children (see Section 3.4). NYSDOH (2006) also provides a benchmark value for sub-slab soil vapor TCE concentrations at 250 $\mu g/m^3$, above which indoor air is likely to be impacted adversely under default conditions.

Subsequently, in addition to maintaining the current mitigation engineering controls implemented by the TCRA, the primary objective of the NTCRA action is to capture offsite soil gas with TCE concentrations greater than 250 $\mu g/m^3$.

Based on evaluation of offsite soil gas and sub-slab soil vapor test results (see Section 2.2.2 and 2.2.3), offsite soil gas with TCE concentrations above 250 $\mu g/m^3$ extends to the east of Site 1 approximately

270 feet in the deep-vadose zone (40 to 50 feet bgs) and 170 feet in the intermediate-vadose zone (20 to 40 feet bgs) (Figures 2-1 through 2-3).

3.2.2 Removal Action Scope

In the preparation of this EE/CA, three removal action alternatives were scoped and developed to meet the RAOs. Each removal alternative considers the recent implementation of the TCRA engineering controls completed in May 2009 (see Section 2.2.2). The scope of each NTCRA alternative consists of the following (see Section 4.0 for identification and evaluation of each alternative):

- **Alternative 1 – No Action**: The no action alternative implies that no removal work would be done at this site. OM&M of the TCRA engineering controls in nearby residences would cease. Contaminant concentrations would not be monitored. Only Five-Year Reviews would be included in this alternative.

- **Alternative 2 – Long-Term OM&M of Engineering Controls**: OM&M of the TCRA engineering controls would continue. Air and soil gas samples would be collected and evaluated to support a monitoring program until RAOs are met, at which time the engineering controls could be shut down and removed.

- **Alternative 3 –SVE Containment System, Engineering Controls, and OM&M**: An SVE containment system would be installed, operated, and maintained to contain and capture offsite soil gas. OM&M of the TCRA engineering controls would continue. Air and soil gas samples would be collected and evaluated to support a monitoring program (performance monitoring for both the residential engineering controls and the SVE containment system) until RAOs are met, at which time the engineering controls and SVE containment system could be shut down and removed.

3.3 DETERMINATION OF REMOVAL SCHEDULE

The EE/CA will be placed in the Administrative Record, and notice of its availability for public review along with a brief summary will be published in local newspapers. The EE/CA will then be subjected to a 30-day public comment period. A public information session will be held during or immediately following the public comment period if requested. A Responsiveness Summary will be prepared and included in the Administrative Record if significant comments are received.

Since this removal action has been designated non-time-critical, the start date will be determined by factors other than the urgency of the threat. Following public review and finalization of the EE/CA, the removal action work plan and/or removal action design would be prepared along with a Navy Action Memorandum. The removal action timeframe includes the time required for mobilization and setup of equipment, and implementing the selected removal action, all of which would begin in fall 2009. Only

Alternative 3 would include construction activities (installation and startup of a new SVE containment system), which would take approximately 3-4 months to complete. However, both Alternatives 2 and 3 would require long-term performance monitoring to determine when RAOs are achieved (between 5 years to more than 30 years). Section 4.0 provides details regarding the estimated amount of time necessary to complete each removal alternative.

3.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The removal action will comply to the extent practicable with ARARs under federal and state environmental laws, as described in 40 CFR 300.415. Tables 3-1 and 3-2 present the evaluation of ARARs (state ARARs are the NYS Standards, Criteria, and Guidelines [SCGs; NYSDEC, 1990]). Other federal and state advisories, criteria, or guidance, as appropriate, will be considered as appropriate in formulating the removal action. Applicable requirements are those requirements specific to the conditions at Site 1 that satisfy all jurisdiction prerequisites of the law or requirements. Relevant and appropriate requirements are those that do not have jurisdiction authority over the particular circumstances at Site 1, but are meant to address similar situations, and therefore are suitable for use at Site 1. Federal ARARs are determined by the lead agency, which in this case is the Navy. As outlined by 40 CFR 300.415(j), the lead agency may consider the urgency of the situation and the scope of the removal action to be conducted in determining whether compliance with ARARs is practicable. The NCP, 40 CFR 300.400(g)(2), specifies factors to consider in determining what requirements of other environmental laws are relevant and appropriate:

- The purpose of the requirement in relation to the purpose of CERCLA
- The media regulated by the requirement
- The substance(s) regulated by the requirement
- The actions or activities regulated by the requirement
- Variations, waivers, or exemptions of the requirement
- The type of place regulated and the type of place affected by the release or CERCLA action
- The type and size of the facility or structure regulated by the requirement or affected by the release
- Consideration of the use or potential use of affected resources in the requirement

In some circumstances, a requirement may be relevant to the particular site-specific situation but may not be appropriate because of differences in the purpose of the requirement, the duration of the regulated activity, or the physical size or characteristic of the situation it is intended to address. There is more discretion in the judgment of relevant and appropriate requirements than in the determination of applicable requirements.

Three classifications of requirements are defined by USEPA in the ARAR determination process: chemical-specific, location-specific, and action-specific.

- **Chemical-specific ARARs** are health or risk management-based numbers or methodologies that result in the establishment of numerical values for a given media that would meet the NCP "threshold criterion" of overall protection of human health and the environment. These requirements generally set protective cleanup concentrations for the chemicals of concern in the designated media, or set safe concentrations of discharge for remedial activity.

- **Location-specific ARARs** restrict remedial activities (i.e., removal actions) and media concentrations based on the characteristics of the surrounding environments. Location-specific ARARs may include restrictions on remedial actions within wetlands or floodplains, near locations of known endangered species, or on protected waterways.

- **Action-specific ARARs** pertain to the implementation of a given remedy. These ARARs control or restrict hazardous substance- or pollutant-related activities. These controls are considered when specific removal activities are planned for a site.

In addition to ARARs, other regulations and guidance may be classified as guidance "To Be Considered" (TBC). TBCs are non-promulgated, non-enforceable guidelines or criteria that may be useful for developing removal actions or necessary for determining what would be protective of human health and/or the environment. TBCs are also identified in this section to aid in the evaluation of the removal actions. Potential federal ARARs and TBCs are presented in Table 3-1 and potential state ARARs and TBCs and are presented in Table 3-2.

Section 121(d)(4) of CERCLA identifies circumstances under which ARARs may be waived, including the instance where the selected removal action is an interim remedy and the final remedial action will attain the ARAR upon its completion. As such, the selected removal actions for the sites being addressed under this EE/CA do not necessarily need to comply with all identified ARARs.

3.5 GENERAL DISPOSAL REQUIREMENTS

Based on data from previous investigations, any investigation- or construction-derived media resulting from the removal action outlined in this EE/CA are assumed to be nonhazardous. Applicable waste would be disposed using generator knowledge and/or would be sampled for toxicity characteristic leachate procedure (TCLP), reactivity, corrosivity, and ignitability for complete waste characterization prior to disposal. Any materials that appear to be potentially hazardous would be set aside until analytical testing could be performed to confirm its nature. Nonhazardous waste would be disposed in a Navy-approved and permitted RCRA Subtitle D landfill. Any waste classified as hazardous would be appropriately disposed.

4.0 DESCRIPTION AND EVALUATION OF REMOVAL ACTION ALTERNATIVES

Three removal alternatives were developed for the NTCRA at Site 1. Based on investigations conducted at the site, and the implementation of the TCRA in February to May 2009, there is no excessive risk to human health under current conditions (i.e., carcinogenic risk is less than 1×10^{-4} and HI is less than 1.0). However, the engineering controls installed during the TCRA must remain in operation to maintain reduced residential risk conditions east of Site 1. Alternatives evaluated in this EE/CA include a no action alternative and two OM&M alternatives, one of which also incorporates a containment technology. This section provides a description and initial evaluation of each alternative. Section 5.0 completes the alternative evaluation and recommendation with a comparison of each alternative.

4.1 IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

Treatment technologies initially screened for Alternative 3 were considered using professional judgment and information from previous investigations and actions. Both thermal desorption and incineration treatment technologies are recognized by the EPA and industry for their effectiveness to address VOC-impacted soils (and, thus, VOC soil gas). However, these ex situ treatment technologies would be more difficult to implement as compared to in situ SVE. Wide-area, deep excavation activities would be required for on- or offsite soil treatment (and transportation for offsite treatment) via thermal desorption or incineration. Sufficient excavation would be precluded in the residential areas where contamination lies beneath the structures. In situ technologies such as thermal desorption or vitrification would cause additional soil vapor intrusion issues, and, thus, would require an SVE component and/or additional engineering controls to minimize these issues. These technologies would not be cost-effective considering the relatively low concentrations of CVOCs in soil at depth over such a large area. Subsequently, these more costly and invasive treatment technology applications were eliminated in favor of the less-invasive in situ SVE technology.

The three removal action alternatives developed for the NTCRA at Site 1 are as follows:

- Alternative 1 – No Action
- Alternative 2 – Long-Term OM&M of Engineering Controls
- Alternative 3 – SVE Containment System, Engineering Controls, and OM&M

With the exception of Alternative 1 (No Action), each of the removal alternatives evaluated requires long-term OM&M until cleanup levels are achieved. For alternative evaluation, comparison, and cost estimating purposes, it is assumed that 12 APUs are installed and operating in 10 residences and 6 SSDs are installed and operating in 6 residences. For Alternative 2, the APUs and SSDs would operate indefinitely (see Section 4.1.2 and 4.2.2). For Alternative 3, once the SVE Containment System has been

operating for a period of 2 years, it is assumed that the APUs and SSDs can be shut down and removed (see Section 4.1.3 and 4.2.3).

4.1.1 Alternative 1 – No Action

The no action alternative implies that no removal work would be completed at this site. The site will be left as it currently exists leaving the soil and soil gas contamination at levels posing potential risk to human health. In addition, current engineering controls in affected residences would be shut down and removed. Because contaminants would remain onsite, Five-Year Reviews would be required to assure protectiveness (statutory requirement).

4.1.2 Alternative 2 – Long-Term OM&M of Engineering Controls

This alternative consists of O&M of the 12 APUs and 6 SSDs installed in residences during the TCRA; periodic monitoring of indoor air, ambient air, and sub-slab soil gas; and Five-Year Reviews.

APUs are a GAC-based filtration system that remove CVOCs through recirculation of indoor air and chemical adsorption. The SSDs operate by purging CVOC-contaminated soil vapors from underneath the residences and prevent soil vapor intrusion by creating a vacuum underneath the structure.

Alternative 2 relies on the natural attenuation (mainly degradation and volatilization) of CVOCs adsorbed to soil and in the soil gas phase to meet cleanup levels. However, the timeframe for CVOC concentrations in soil and soil gas to meet cleanup levels without other actions is estimated to be greater than 30 years. Periodic monitoring of indoor air, ambient air, and sub-slab soil vapor would be performed to measure effectiveness of the engineering controls and determine when RAOs are achieved.

O&M of the APUs and SSDs would include electrical power for the APUs and SSDs, quarterly HEPA filter replacement for the APUs, biannual GAC replacement for the APUs, blower maintenance for the SSDs, and management of associated investigation- or construction-derived waste material. Waste requiring disposal would be containerized and temporarily stored at Site 1 prior to characterization and disposal.

Performance monitoring related to the engineering controls implemented during the TCRA are ongoing through early 2010. This NTCRA Alternative 2 includes development of a monitoring plan (to be developed during the design or work planning phase) and continued monitoring for 30 years. Monitoring would consist of annual sub-slab soil vapor sampling and SSD-stack emission gas, indoor air, and upwind ambient air. Each sample would be analyzed by EPA Method TO-15 modified for site-specific CVOCs. Stack and soil gas samples would be collected via SUMMA canister with a 30-minute collection time, while indoor and ambient air samples would be collected over 24 hours. Data reports would be generated annually. If long-term soil gas data show that CVOC concentrations are not decreasing at an

acceptable rate, other actions may be needed to expedite achieving the RAOs and to minimize long-term costs of OM&M.

4.1.3 Alternative 3 – SVE Containment System, Engineering Controls, and OM&M

Alternative 3 consists of the scope of Alternative 2 and installation and OM&M of an SVE containment system. SVE involves the application of a vacuum through wells installed within unsaturated-zone soils (the vadose zone). Vacuum is applied to the subsurface using a vacuum blower with the inlet connected to the vapor extraction wells and the outlet connected to a treatment system or directed to the atmosphere. The application of vacuum to the subsurface results in the flow of soil vapor to the vapor extraction wells. SVE remediates the subsurface not only by the removal of contaminated soil vapors, but also by enhanced volatilization from soil particles induced by lower subsurface pressure. Soil vapors from the extraction wells are conveyed through piping to the vacuum blower, and are then discharged to the atmosphere with or without treatment. The benefits of the SVE technology include the following:

- SVE is a readily available, proven technology; it does not rely on site-specific geochemistry or specialized tools to implement other than standard drilling equipment, piping, and vacuum pumps.
- SVE is not dependent on the successful introduction of any amendments into the subsurface.
- SVE generates a waste stream (i.e., extracted vapors) that can be discharged to ambient air or can be easily treated with activated carbon, which can then be recycled.

The January 2009 SVE pilot test provided data and information to support the development of this alternative and a subsequent system design (see Section 2.2.2) (Tetra Tech, 2008e). The SVE containment system would consist of the following elements:

- Soil vapor extraction wells
- Moisture separator
- Soil vapor extraction blowers
- Vapor-phase GAC unit for off-gas treatment
- Soil vapor pressure monitors (SVPMs)

Six SVE well pairs (i.e., 12 SVE wells) would be located along the eastern boundary of Site 1 as shown in Figure 4-1. One SVE well pair (SVE-101-I and 101-D) was installed for the pilot test at location SVE-101. Based on the pilot test results, and depending on field conditions during installation, the SVE wells would be screened at of depths of approximately 25 to 35 feet (intermediate-depth wells) and 40 to 60 feet (deep wells). Proposed well construction details are shown on Figure 4-2 and tabulated below.

Parameter	Intermediate-Depth Wells	Deep Wells
Number	Six (including one existing)	Six (including one existing)
Vacuum	4 inches water column	4 to 20 inches water column
Flow Rate	50 cubic feet per minute (cfm)	
Well Depth	35 feet bgs	60 feet bgs
Screen Interval	25 to 35 feet bgs	40 to 60 feet bgs
Screen Type	2-inch ID, 20-slot, Schedule 40 PVC	
Riser Type	2-inch ID, Schedule 40 PVC	
Sand Pack	No. 2 sand to 1 foot above the well screen.	
Bentonite Seal	Minimum 2 feet	
Boring Grout	Bentonite/cement to 4 feet bgs	
Well Completion	Leak-tight, threaded well cap and lockable stick-up steel casing, grouted to 4 feet bgs	

Each SVE well would discharge to a flow monitoring station where flow, vacuum, and soil gas quality could be measured, and all flow would be combined and discharged to a treatment building (see Figure 4-1 for proposed locations). Within the treatment building, the extracted soil vapor would flow through a 1,000-gallon moisture separator to remove condensate. Two blowers (one operating and one auxiliary) would be used to convey the extracted soil vapor. Each blower would be rated for 600 cfm based on pilot test results (each motor would be 480 volt, 3-phase, and 7.5 horsepower).

The discharge from the blowers would be conveyed to a GAC unit to remove VOC prior to venting to the atmosphere via a discharge stack. For cost-estimating purposes, and based on expected TCE mass removal and carbon usage rates, it is assumed that a single-stage 5,000-pound GAC unit would be required for the first year of operation. The unit can then be removed (and disposed appropriately) pending review of performance monitoring data.

All system piping located outside the buildings would be buried below the frost line (approximately 4 feet bgs). The piping would be placed on a bedding of well graded sand and covered with the same material obtained from an offsite source. Excavated soils from the trench would be considered for reuse for the remainder of excavation or disposed offsite appropriately (as described in Alternative 2 for derived material). The formation of condensate in the buried piping would likely be less than 100 gallons per month from December to April. During other months, and in particular during the summer and fall when the ambient air temperature is typically greater than the soil and groundwater temperature, evaporation would be expected from the moisture separator; however, condensate could be removed on a periodic basis, tested, and disposed appropriately offsite.

The flow monitoring station would be constructed of a pre-fabricated metal shed with limited ventilation and located on a concrete slab and footer. If required during winter operation, a portable propane heater could be used to prevent condensate within the piping from freezing.

System performance would be measured by soil gas sample data (TO-15 modified VOC analysis via SUMMA canisters; similar to the soil gas investigation samples) and soil vacuum pressure data (via SVPMs) onsite and east of Site 1 in the residential community. Performance would also be measured by vapor sample data (VOC analysis) from each SVE well, intermediate vapor sample data prior to the GAC treatment unit, and off-gas sample data. An OM&M plan would be developed for the SVE Containment System and the offsite engineering controls.

Up to 12 SVPMs would be used to monitor vacuums in the areas east of Site 1 and along the Site 1 fence line as shown in Figure 4-3. Based on previous investigations and pilot test data, the SVPMs would likely be screened at depths of 8 to 10 feet bgs (shallow), 23 to 25 feet bgs (intermediate-depth), and 40 to 50 feet bgs (deep) (see Figure 4-2 for construction details). Seven SVPMs (SVPM-2002-S, 2002-I, 2002-D, 2003-I, 2003-D, 2007-I, and 2007-D) were installed using direct push technology (DPT) for the SVE pilot test in January 2009 (Figure 4-3). These SVPMs would be re-developed and permanently completed (e.g., flush mount and concrete pad). Proposed SVPM-2004I and 2004D would also be installed (Figure 4-3). The SVPMs would include a sealed cap, valve, and threaded sample port to measure vacuum pressure.

Additional details and specifications, including operations and controls, would be determined and finalized in a removal action design, work plan, and/or OM&M plan.

4.2 EVALUATION OF REMOVAL ACTION ALTERNATIVES

Table 4-1 summarizes the evaluation of Alternatives 1, 2, and 3.

The *effectiveness* of a technology refers to its capability of removing the specific items in the volumes required, the degree to which the technology achieves the RAO, and the reliability and performance of the technology over time, including protection of human health and the environment, compliance with ARARs to the extent practicable, long-term effectiveness and permanence, reduction in the toxicity, mobility or volume, and short-term effectiveness.

The *ease of implementation* of a technology refers to the availability of commercial services to support it, the constructability of the technology under specific site conditions, and the acceptability of the technology to all parties involved (e.g., regulators, public, owner), including technical feasibility, administrative feasibility, availability of services, support agency acceptance, and community acceptance.

For the *detailed cost analysis* of the alternatives, the expenditures required to complete each measure were estimated in terms of (1) capital costs to complete initial construction activities; (2) future post-construction OM&M costs to ensure the continued effectiveness of the selected removal alternative; and (3) future post-construction periodic costs (e.g., five-year reviews, system shutdown, etc.). The future costs were calculated depending on the estimated timeframe of the alternative. A present value (PV) analysis discounts all future costs to a common base year (2009). PV analyses allow the cost of the removal action to be compared based on a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the life of the removal action. The PV calculations included assumed discount rates for each alternative (Office of Management and Budget [OMB], 2008):

- Alternative 2 – Discount rate at 2.7 percent for its estimated 30-year timeframe
- Alternative 3 – Discount rate at 1.6 percent for its estimated 5-year timeframe

The costs estimated are provided to an accuracy of +50% and –30%. The alternative cost estimates are in 2009 dollars and based on quotations from potential vendors and subcontractors, engineering estimates, recent and continual project experience on similar Navy projects, and published values by R.S. Means. Refer to Appendix B for all cost estimate details pertaining to each alternative.

4.2.1 Alternative 1 – No Action

No removal work would be completed at this site, leaving the soil and soil-gas contamination at levels posing potential risk to human health. Shutting down and/or removing the current engineering controls (which currently remove the exposure route and reduce exposure levels) in affected residences would result in potential unacceptable risk. This alternative would not meet ARARs or the RAOs. Selection of this alternative would not satisfy the objective of this EE/CA.

4.2.2 Alternative 2 – Long-Term OM&M of Engineering Controls

This alternative includes continued OM&M of the APUs and SSDs installed during the TCRA in affected residences, relying on the natural attenuation of CVOCs adsorbed to soil and in the soil gas phase to achieve RAOs. However, the timeframe for CVOC concentrations in soil and soil gas to meet cleanup levels without other actions is estimated to be greater than 30 years. Periodic monitoring of indoor air, ambient air, and sub-slab soil gas would be performed to measure effectiveness of the engineering controls and determine when RAOs are achieved. Therefore this alternative would be protective of human health and the environment. This alternative is expected to comply with ARARs, and would meet the intentions of the NYSDOH (2006) guidance (TBC; see Tables 3-1 and 3-2).

The potential for worker exposure is limited to air and soil gas monitoring, O&M of the APUs and SSDs (including quarterly HEPA filter replacement and GAC replacement once every 2 years for the APUs, blower and conduit maintenance for the SSDs, etc.), management of associated investigation- or construction-derived waste, and site inspections. Waste requiring disposal would be containerized and temporarily stored at Site 1 prior to characterization and disposal. Health and safety precautions would be required to protect workers and the community during transport and storage of derived wastes and/or materials.

This alternative is easily implemented because actions associated with this removal action are limited to continuing O&M of the in-place engineering controls (APUs and SSDs), continuing the established monitoring program from the TCRA (and then to-be-modified program pending a longer-term monitoring plan based on this EE/CA). If long-term soil gas data show that CVOC concentrations are not decreasing at an acceptable rate, other actions may be needed to expedite achieving the RAOs and to minimize long-term costs of OM&M.

The estimated total cost (sum of capital and PV-future costs) for Alternative 2 is $2.4 million (M) (assuming the RAOs would be achieved in 30 years). Because the engineering controls are already in place, the capital cost ($24,000) for this alternative consists mainly of the preparation of a monitoring plan. Long-term costs (PV $2.4M over 30 years) include O&M of the APUs and SSDs, monitoring, quarterly site inspections, Five-Year Reviews, and associated data management and reporting. Assumptions for cost estimating purposes are provided in Appendix B.

4.2.3 Alternative 3 – SVE Containment System, Engineering Controls, and OM&M

This alternative includes the same scope as Alternative 2 in addition to the installation and OM&M of an SVE Containment System (including the SVPMs). Therefore, with appropriate engineering controls applied to the SVE Containment System, this alternative would be protective of human health and the environment. The SVE Containment System would increase the capital cost significantly, but would shorten the timeframe to achieve RAOs to approximately 5 years. However, SVE system O&M and the associated SVE performance monitoring would add to the future costs of the decreased timeframe. This alternative is expected to comply with ARARs, and would meet the intentions of the NYSDOH (2006) guidance (TBC; see Tables 3-1 and 3-2).

The potential for worker exposure is similarly limited to OM&M of the offsite engineering controls. However, installation and OM&M increases the short-term and long-term risks for workers and increases the difficulty of the alternative's implementation. Waste and material volume would increase due to the system installation and OM&M (wastes and materials would be handled and disposed appropriately). Additional site visits would be required due to the OM&M of the SVE Containment System.

Although installation of an SVE System would increase the difficulty of implementation, SVE system installation and O&M are common industry practices. Multiple qualified contractors, resources, and materials would be available. Long-term performance data of the SVE Containment System and the offsite engineering controls would be reviewed to evaluate potential optimization or partial shut down (e.g., change SVE rates on individual wells, shut off APUs and/or SSDs when RAOs are met in certain areas, etc.). This alternative increases the administrative requirements due to more complicated O&M and potential regulatory interactions, reporting, and utility requirements.

The estimated total cost (sum of capital cost and PV-future costs) for Alternative 3 is $2M (assuming the RAOs would be achieved in 5 years). Capital costs ($1.2 million) for this alternative include preparation of a removal action design and/or removal action work plan, and preparation of an OM&M plan for the SVE Containment System and the offsite engineering controls. Long-term costs (PV $760,000 over 5 years) include OM&M of the APUs and SSDs for 2 years, OM&M of the SVE Containment System for 5 years, site inspections, one Five-Year Review, and associated data management and reporting. Assumptions for cost estimating purposes are provided in Appendix B.

5.0 COMPARATIVE ANALYSIS OF REMOVAL ALTERNATIVES

This section provides a comparative analysis of the three removal alternatives presented in Section 4.0 to assist the decision-making process by which a removal action will be selected. In Section 4.0, these alternatives were evaluated according to their effectiveness (including protection of human health and the environment, compliance with ARARs to the extent practicable, short- and long-term effectiveness, and reduction in toxicity, mobility, or volume), ease of implementation (including technical and administrative feasibility, availability of services, support agency acceptance, and community acceptance), and cost. In this section, the alternatives are directly compared for each of the three criteria.

Levels of effectiveness were assessed based upon the number of "effectiveness criteria" that would be satisfied by each alternative. The "effectiveness criteria," from the EPA (1993) are identified as:

- Protection of human health
- Protection of workers during implementation
- Protection of environment
- Compliance with ARARs
- Level of treatment and containment expected
- Residual effect concerns

Levels of implementability were assessed based upon the number of "implementability criteria" satisfied by each alternative. Evaluation of implementability essentially assesses the technical and administrative feasibility of completing each task. The "implementability criteria" from the EPA (1993) are as follows:

- Technical Feasibility Elements
  - Construction and operational considerations
  - Demonstrated performance/useful life
  - Adaptable to environment conditions
  - Contributes to remedial performance
  - Implementation in 1 year
  - Availability of equipment, personnel, and services
  - Availability of outside laboratory testing capacity and offsite treatment and disposal capacity

- Administrative Feasibility Elements
  - Permits required
  - Easements or rights-of-way required
  - Impact on adjoining property
  - Ability to impose institutional controls

5.1 REMOVAL ALTERNATIVE COMPARISON

Referring to Table 5-1:

- **Alternative 1 – No Action** is not effective in that it does not accomplish the objective of this NTCRA, which is to reduce the risk to human health. Although this alternative is easy to implement and there is no cost associated with it other than future costs of Five-Year Reviews, it is not a desirable alternative, because the overall objective is not met.

- **Alternative 2 – Long-Term OM&M of Engineering Controls** is effective in reducing human health risk, but will take longer to meet the RAOs. Alternative 2 is easier to implement than Alternative 3, because the offsite engineering controls were previously installed under the TCRA and OM&M efforts would continue under this NTCRA. However, there is an uncertainty associated with the long-term reliability and protectiveness of the offsite engineering controls because they are not under direct control of the Navy. The indefinite timeframe to meet the RAOs (greater than 30 years) increases the administrative complexity and future OM&M cost of the alternative.

- **Alternative 3 – SVE Containment System, Engineering Controls, and OM&M** is effective in that it accomplishes the objective of this NTCRA, will achieve the RAOs in the shortest timeframe, and, although capital-intensive, is $500,000 less than Alternative 2. While this alternative is more difficult to implement and administratively manage, it utilizes a well-known and industry-common treatment technology (SVE), which can be implemented and operated relatively easily by a qualified contractor.

5.2 RECOMMENDED ALTERNATIVE

This EE/CA was performed in accordance with current EPA and Navy guidance documents for a NTCRA under the CERCLA framework. The objective of this EE/CA for Site 1 was to develop a NTCRA alternative to reduce the potential risk to human health, as well as to contain, control, and remove impacted soil vapor. Three alternatives were identified, evaluated, and ranked.

The comparative analysis included evaluating the effectiveness, implementability, and cost of each alternative. The evaluation of effectiveness included reviewing the protectiveness of the alternative; compliance with ARARs to the extent practicable; long-term effectiveness and permanence; reduction in toxicity, mobility, or volume; short-term effectiveness; and its ability to meet the RAOs. The evaluation of implementability included looking at the technical feasibility, availability, and administrative feasibility of the alternatives. The evaluation of cost included a review of capital and future costs.

Based on the comparative analysis of the alternatives completed in Section 5.0, the recommended removal action is Alternative 3 – SVE Containment System, Engineering Controls, and OM&M. This

alternative meets the objective of the NTCRA and provides the best balance of trade-offs based on the evaluation criteria.

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TABLE 2-1
PREVIOUS INVESTIGATIONS AND ACTIONS AT SITE 1
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK
PAGE 1 OF 2

Date	Activity/Document	Findings/Comments
1986	IAS (Rogers, Golden & Halpern, 1986)	Potential releases of CVOCs and metals were identified from historic waste handling practices.
1991-1992	Phase 1 RI for Sites 1, 2, and 3 (HNUS, 1992)	Soil and groundwater sampling confirmed the presence of VOC- and metal-contaminated soil and groundwater at Site 1. Potential PCB-contamination in soil identified. The Phase I RI Report recommended additional RI activities to fully characterize the site.
1993	Phase 2 RI for Sites 1, 2, and 3 (HNUS, 1993)	Investigation further defined the extent of soil and groundwater contamination.
1993	Interim Soil Cover for PCBs at Site 1	Interim soil cover was placed over PCB-contaminated soil to protect site workers.
1994	FS for Sites 1, 2, and 3 (HNUS, 1994)	Evaluated remedial technologies and process options for addressing soil and groundwater contamination at the site. Contamination was characterized as metals and PCBs in the shallow soils (less than 7 feet bgs) and VOCs throughout the soil column to the water table (approximately 50 feet bgs) and in the shallow groundwater.
1995	ROD for Sites 1, 2, and 3 (HNUS, 1995)	ROD specifies excavation remedy for metal- and PCB-contaminated soils, and AS/SVE remedy for VOC-impacted shallow groundwater and soils. The ROD did not identify soil gas migration as a pathway of potential concern.
1995	Pre-RD Investigation No. 1 (C.F. Braun, 1995a and 1995b; Foster Wheeler, 1995).	Study was conducted to better define the extent of metal-, VOC-, and PCB-impacted soils. PCBs were present deeper than 12 feet bgs. VOC-contaminated soil was bounded laterally.
1996	Pre-RD Investigation No. 2 (Foster Wheeler, 1996)	Additional study to determine vertical extent of PCB-impacted soil. PCBs were present deeper than 50 feet bgs.
1998-2002	AS/SVE Remedy (C.F. Braun, 1997; Foster Wheeler, 2001a, 2001b, and 2003)	Treatment removed approximately 4,500 pounds of VOCs from groundwater. Groundwater VOC concentrations reduced to cleanup goals for VOCs.
1998	AOC and Solid Waste Management Units (SWMU) Investigation (H2M, 2003)	As part of Northrop Grumman vacating the NWIRP property, Northrop Grumman conducted a facility-wide investigation of potential AOCs and SWMUs. Most AOCs and SWMUs were remediated and closed. Northrop Grumman excavated and backfilled Drywells/AOCs 20-08 and 34-07. Residual PCB soil contamination was identified deeper than 28 feet bgs during confirmation sampling. AOCs 23, 30, and 35, which were identified to be impacted by metals and PCBs, were not addressed.
2000	Drywell Investigation (H2M, 2003)	Additional delineation of PCB contamination at each drywell location (AOCs 20-08 and 34-07). PCB contamination was found as deep as 60 feet bgs.
2002	Pre-RD Investigation No. 3 (Foster Wheeler, 2003)	Study was conducted to evaluate the effectiveness of the AS/SVE system on VOC removal in soils and better define the extent of PCB- and metal-contaminated soils. PCB-contaminated soil was found deeper than 60 feet bgs throughout the site.
2003	ROD for Operable Unit (OU) 2 (Navy, 2003)	ROD specifies the management of groundwater investigations and actions for groundwater under new OU 2.
2003-2007	Site 1 PCBs and Metals Remedy Evaluations	The Navy conducts a series of internal evaluations of potential alternative remedies for addressing PCB and metal contamination at Site 1.
2005-2007	Soil Vapor Concerns	Navy and NYSDEC identify residual CVOC contamination in soil and soil vapor at Site 1, with the potential for offsite soil gas migration. Navy prepares a work plan for a soil gas investigation. Navy and NYSDEC discuss preliminary options to address potential CVOC-impacted soil gas migration and associated risks.
January 2008	Soil Gas Investigation Phase I (TtNUS, 2008)	Soil gas samples were collected from soil vapor pressure monitors (SVPMs) modified during the investigation and temporary Direct Push Technology (DPT) locations at varying depths (e.g., 8, 20, and 45 feet bgs) at the facility fence line on the east side of Site 1 (approximately 70 feet from residential housing). Trichloroethene (TCE), tetrachloroethene (PCE), and 1,1,1-trichloroethane (TCA) were detected in the soil gas samples above the NYSDOH (2006) guidance values for sub-slab soil vapor concentrations. The investigation concluded that CVOC-impacted soil gas migration was likely. Additional sampling was recommended east of the site to delineate soil gas CVOC concentrations in the residential area.

TABLE 3-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
FEDERAL CHEMICAL-SPECIFIC ARARs					
Clean Air Act (CAA)					
Air	National Ambient Air Quality Standards (NAAQS) specify the maximum concentration of each criteria pollutant (carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, sulfur dioxide) which is to be permitted in the ambient air, as averaged over a period of time. Requirements differ for new sources of air pollutant emissions and existing sources. Requirements also differ based on the air quality designation of the site's location (i.e., attainment, non-attainment, unclassified, or transport).	Emissions of criteria pollutants during the response action, or during O&M of the response action. NAAQSs are not enforceable in and of themselves. Any substantive standards contained within the State Implementation Plan (SIP) are, however, federally enforceable.	40 CFR 50.4 to 50.12	Not Applicable	Relevant (but not appropriate) to NTCRA Alternative 3, if selected. Alternative 3 includes SVE Containment System. The mass of volatiles removed during the SVE alternative would be well-below NAAQS criteria levels. CVOCs in off-gas would be treated as necessary to assure compliance with the SIP. Periodic off-gas sampling would be included in Alternative 3.
Air	New Source Performance Standards (NSPS) are emission standards to ensure that new sources are designed, built, and operated in a manner that reflects the best demonstrated technology and retain economic feasibility in a uniform manner across the country. Four designated pollutants (fluorides, sulfuric acid mist, total reduced sulfur, and municipal waste combustor emissions) have been designated. To-date NSPSs have been promulgated for over 50 source categories.	Emissions of designated pollutants from a major new stationary source or major modifications to an existing source.	40 CFR 60.1 to 60.2875	Not Applicable	No major new source or modification to existing source would be created for the NTCRA at Site 1.
Air	National Emission Standards for Hazardous Air Pollutants (NESHAPs) are point-source standards for hazardous air pollutants. These standards address both new and existing sources at the point of emission. Eight hazardous air pollutants (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride) were initially designated. The 1990 amendments greatly expanded the list of hazardous air pollutants, including 189 new pollutants and designating 174 source categories. Maximum Achievable Control Technology standards were developed for all source categories that emit hazardous air pollutants.	Emissions of hazardous air pollutants from a point source.	40 CFR 61.01 to 61.359	Not Applicable	Relevant (but not appropriate) to NTCRA Alternative 3 (SVE), if selected. These standards were developed for specific, significant sources. Any chlorinated volatile vapors (e.g., TCE) from the SVE Containment System would be treated as necessary prior to emission.
Clean Water Act (CWA)					
Surface water	Both on-site and off-site direct discharges of pollutants (126 pollutants are listed) to surface waters are required to meet the substantive requirements of the National Pollutant Discharge Elimination System (NPDES) program. These substantive requirements include discharge limitations (both technology and water quality based), certain monitoring requirements, and best management practices. Ambient water quality standards include Federal water quality criteria and State water quality standards.	Direct discharges to surface waters.	CWA §303, 304, and 402 (42 USC 7401) Federal Ambient Water Quality Criteria (AWQC) (40 CFR 50)	Not applicable	No discharge to surface waters in any of the proposed alternatives.
Safe Drinking Water Act (SDWA)					
Groundwater	SDWA standards serve to protect public water systems. Primary drinking water standards consist of federally enforceable Maximum Contaminant Levels (MCLs). MCLs are the highest level of a contaminant that is allowed in drinking water.	Impact to public water systems that have at least 15 service connections or serve at least 25 year-round residents. May also be cleanup standards for on-site ground or surface waters that are current or potential sources of drinking water.	40 CFR 141.11 to 141.16 and 141.61 to 141.66	Not Applicable	Applicable only to groundwater. This EE/CA does not address groundwater

TABLE 3-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
Groundwater	National Secondary Drinking Water Regulations (NSDWRs or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color)	Impact to public water systems that have at least 15 service connections or serve at least 25 year-round residents. May also be cleanup standards for on-site ground or surface waters that are current or potential sources of drinking water.	40 CFR 143	Not Applicable	Applicable only to groundwater. This EE/CA does not address groundwater
Groundwater	SDWA standards serve to protect public water systems. The MCL Goal (MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.	Impact to public water systems that have at least 15 service connections or serve at least 25 year-round residents. May also be cleanup standards for on-site ground or surface waters that are current or potential sources of drinking water.	40 CFR 141.50 to 141.55	Not Applicable	Applicable only to groundwater. This EE/CA does not address groundwater
Resource Conservation and Recovery Act (RCRA) Subtitle C					
Waste / soil / water	Defines those solid wastes which are subject to regulation as hazardous wastes. Determines potential waste classification and applicability of land disposal restrictions and other solid and hazardous waste rules.	Treatment, storage, and/or disposal of wastes (i.e., soil, water, solid waste) that exhibits the characteristics of ignitability, corrosivity, reactivity, or toxicity, or if it is listed as a hazardous waste.	40 CFR 261	Applicable	Construction- and investigation-derived waste and materials from implementation of Alternatives 2 or 3 would be characterized and managed in accordance with RCRA requirements. Considering previous investigations and remedial actions, as well as historical waste characterization of all media at the site, any derived materials or media are expected to be nonhazardous and would not be listed by the Navy. However, any wastes to be managed would be characterized and disposed appropriately. O&M wastes would include SVE vapor condensate and the used GAC pre-treatment material, which would also be managed appropriately.
Soil	Soils contaminated by hazardous waste must be treated in accordance with the land disposal requirements.	Disposal of soils containing hazardous waste	40 CFR 268	Applicable	Only applies if waste removed from site is characterized as hazardous. No media to be handled during Alternatives 2 or 3 is known to be hazardous by characteristic or generator knowledge/listing. Any soil media to be handled would result from intrusive activities associated with installation of SSDs or sub-slab sampling under Alternative 2; or installation of SVE wells, SVPMs, and SSDs or sub-slab sampling under Alternative 3.
Soil, Sediment, groundwater, surface water	Contained-In Policy. Management of soils containing hazardous waste including subjectivity to Land Disposal Restrictions (LDRs).	Environmental media that contains listed hazardous waste must be managed as hazardous because, and only so long as, it contains listed hazardous waste.	40 CFR 261.2 and 40 CFR 268.1	Not Applicable	Contaminated environmental media (groundwater, soil, surface water) at Site 1 during Alternatives 2 and 3 is not considered a listed solid waste (abandoned, recycled, or inherently waste-like). The in situ treatment and movement of contaminated media within an area of contamination is not land disposal. Considering previous investigations and remedial actions, as well as historical waste characterization of all media at the site, any derived materials or media are expected to be nonhazardous and would not be listed by the Navy. However, any wastes to be managed would be characterized and disposed appropriately.

TABLE 3-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
EPA National Screening Values (for Human Health)					
Soil, sediment, groundwater, surface water, and air	Generic risk-based screening values and toxicity values for human health established across all EPA Regions. Typically used for human health risk assessment screening, risk calculations, and Preliminary Remediation Goal (PRG) development.	Contaminated environmental media can be screened against these generic values for a preliminary indicator of risk. Also, one can prepare site-specific values using the reference materials.	EPA National Screening Values (May 2009) http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm	To Be Considered	Values for air to be considered in the public health assessment. NYSDOH guidance values (TBCs) are also included in this ARAR evaluation (see State ARARs).
FEDERAL LOCATION-SPECIFIC ARARs					
Clean Air Act (CAA)					
Attainment area	New major stationary sources shall apply best available control technology for each pollutant, subject to regulation under the Clean Air Act, that the source would have potential to emit in significant amounts. Owner or operator of proposed source or modification shall demonstrate that allowable emissions increases or reductions (including secondary emissions) will not cause or contribute to a violation of the NAAQS or applicable maximum allowable increase over baseline concentrations.	Major stationary sources that emits, or has the potential to emit, 100 tons per year or more of any regulated pollutant; any other stationary source that emits, or has the potential to emit, 250 tons per year or more of any regulated pollutant.	Prevention of Significant Deterioration Standards (40 CFR 52.21)	Not Applicable	Bethpage is located in a non-attainment area. The SVE Containment System (under Alternative 3, if selected) would not be a major stationary source -- it would not emit 100 to 250 tons of any regulated pollutant. Further, any off-gas from the SVE Containment System would be treated via GAC prior to emission. CVOC monitoring in off-gas during O&M might be included in Alternative 3 to assure compliance with federal and state criteria; however, air monitoring is performed by NYSDEC state-wide (nearest monitoring locations to NWIRP Bethpage are at Eisenhower Park and Hempstead within Nassau County) to assure compliance with the Clean Air Act.
Non-attainment area	Source must obtain emissions offsets in Air Quality Control Region of greater than one-to-one. Source subject to "lowest achievable emission rate". All major stationary sources owned or operated by the person in the State are in compliance, or on a schedule for compliance, with all applicable emission standards.	Any stationary facility or source of air pollutants that directly emits, or has the potential to emit, 100 tons per year or more of any air pollutant (including any major emitting facility or source of fugitive emissions of any such pollutants).	CAA Part D §173(1) to (3); 40 CFR 51.18(j)	Not Applicable	Bethpage is located in a non-attainment area. The SVE Containment System (under Alternative 3, if selected), would not be a major stationary source -- it would not emit 100 to 250 tons of any regulated pollutant. Further, any CVOC vapor in the off-gas from the SVE Containment System would be treated as necessary (via GAC prior to emission). Off-gas sampling may be included part of Alternative 3 to assure compliance with federal and state criteria; however, air monitoring is performed by NYSDEC state-wide (nearest monitoring locations to NWIRP Bethpage are at Eisenhower Park and Hempstead within Nassau County) to assure compliance with the Clean Air Act.
Clean Water Act (CWA)					
Wetlands	Avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible.	Action involving construction of facilities or management of property in wetlands. Wetland as defined by Executive Order 11990 Section 7 (protection of Wetlands).	CWA §404; Executive Order 11990; 40 CFR 6, Appendix A	Not Applicable	No wetlands are near Site 1 or NWIRP Bethpage. Wetlands would not be impacted by any of the removal alternatives.
Wetlands	TBC Guidance is to provide site managers and regional wetlands program personnel with policies that will be useful when considering potential ecological impacts of response actions on wetlands at Superfund sites	Remedial activities at CERCLA sites that may impact wetlands	EPA, 1994. *Considering Wetlands at CERCLA Sites* (EPA 540-R-94-019; OSWER 9280.0-03). May.	Not Applicable	This TBC is not applicable to the NTCRA at Site 1. No wetlands are near Site 1 or NWIRP Bethpage. Wetlands would not be impacted by any of the removal alternatives.
Dredged soil/sediments, U.S. Waters, Wetlands	Proposed discharges must be evaluated with respect to impacts on the aquatic ecosystem. No activity that adversely affects a wetland is permitted if a practicable alternative that has less effect is available. If there is no other practicable alternative, impacts must be mitigated.	Action involving discharge of dredged or fill material into U.S. waters, including wetlands.	CWA §401 and 404(b)(1) 40 CFR 230 33 CFR 320-330	Not Applicable	No proposed activities for the NTCRA at Site 1 includes discharges of dredged or fill material into U.S. waters or wetlands.

TABLE 3-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
Safe Drinking Water Act (SDWA)					
Sole source aquifer	SDWA prevents federal funding from being committed to any project that may contaminate a "sole source aquifer," meaning any EPA-designated aquifer that is the only principal drinking water supply for a given area which, if contaminated, would present a significant human health hazard.	Generally, CERCLA activities do not in and of themselves increase pre-existing contamination of sole source aquifers. Although it is unlikely that CERCLA activities would be subject to funding restrictions, a review of potential problems associated with sole source aquifers should be conducted.	40 CFR 149	Not Applicable	Groundwater is not being treated as part of this NTCRA. Activities for NTCRA Alternatives 2 and 3 would not be expected to impact groundwater. Groundwater at NWIRP Bethpage is being addressed separately as Operable Unit 2.
Groundwater	TBC Guidance - EPA Groundwater Protection Strategy for classifications of groundwater.	Different levels of protection of groundwater depending on the EPA classification of groundwater.	*Groundwater Protection Strategy (EPA, 1984).* *Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy (EPA, 1986).*	Not Applicable	This TBC is not applicable to the NTCRA at Site 1. Groundwater beneath and downgradient of the NWIRP site is designated as Class I. Activities for NTCRA Alternatives 2 and 3 would not be expected to impact groundwater. Groundwater at NWIRP Bethpage is being addressed separately as Operable Unit 2.
Resource Conservation and Recovery Act (RCRA)					
Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout. For existing surface impoundments, waste piles, land treatment units, landfills, and miscellaneous units, no adverse effects on human health or the environment will result if washout occurs.	RCRA hazardous waste; treatment, storage, or disposal.	40 CFR 264.18(b); 40 CFR 258.7-13(b)	Not Applicable	NWIRP previously operated under a RCRA treatment, storage, and disposal (TSD) permit; however, facility operations have ceased. Site 1 and NWIRP Bethpage are not in a 100-Year floodplain . No onsite TSDs are considered for removal activities for Site 1; however, an SVE Containment System is part of Alternative 3. Appropriate controls would be implemented to prevent washout during construction and O&M.
Within salt dome formation, underground mine, or cave	Placement of non-containerized or bulk liquid hazardous waste prohibited.	RCRA hazardous waste; placement.	40 CFR 264.18(c)	Not Applicable	No waste will be placed within a salt dome formation, underground mine, or cave.
National Historic Preservation Act					
Historic district, site, building, structure, or object	Avoid impacts on cultural resources; recover and preserve artifacts and historic properties. Where impacts are unavoidable, mitigate through design and data recovery. Plan action to minimize harm to National Historic Landmarks.	Properties listed in the National Register of Historic Places, or eligible for such listing. Alteration of terrain that threatens significant scientific, prehistorical, historical or archaeological data.	*National Historic Preservation Act* , 16 USC 469 to 470; 36 CFR 65; 36 CFR 800	Not Applicable	There are no known historic properties within Site 1 or that would be affected by any of the proposed removal action alternatives.
Endangered Species Act					
Critical habitat of/or presence of an endangered or threatened species	Identify activities that may affect listed species. Actions must not threaten the continued existence of a listed species. Actions must not destroy critical habitat.	Presence of species or habitat listed as endangered or threatened.	*Endangered Species Act* , 16 USC 1531 et. seq.; 50 CFR 200; 50 CFR 402; *Fish and Wildlife Coordination Act* (16 USC 661 et seq.); 33 CFR 320 to 330	Not Applicable	No endangered species are present at Site 1 or NWIRP Bethpage; however, migratory birds occasionally move through the area (see Migratory Bird Treaty Act below).
Wild and Scenic Rivers Act					
Wild, scenic, or recreational river	Determine if project will affect the free-flowing characteristics, scenic, or natural values of a designated river; not authorize any water project or any other project that would directly or indirectly impact any designated river without notifying the Department of Energy or Forest Service.	Any river, and the bordering adjacent land, designated as "wild and scenic or recreational."	*Wild and Scenic Rivers Act* , 16 USC 1271 et. seq.; 36 CFR 297.4; 40 CFR 6.302(e)	Not Applicable	No wild or scenic rivers located at Site 1 or NWIRP Bethpage.

TABLE 3-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
Coastal Management Act					
Coastal zone or area that will affect the coastal zone	Federal activities must be consistent with, to the area that will affect maximum extent practicable, State coastal management programs. Federal agencies must supply the State with a consistency determination.	Wetland, flood plain, estuary, beach, dune, barrier island, coral reef, and fish and wildlife and their habitat, within the coastal .	*Coastal Management Act, 16 USC 1451 et. seq.;* *15 CFR 930.30;* *15 CFR 930.34*	Not Applicable	None of the proposed site activities would affect land or water uses in a coastal zone.
Wilderness Act					
Wilderness area	Areas must be administered in such manner as will leave it unimpaired as wilderness and to preserve its wilderness. The following are not allowed in a wilderness area: commercial enterprises, permanent roads (except as necessary to administer the area), motor vehicles, motorized equipment, motorboats, aircraft, mechanized transport, and structure or buildings.	Any unit of the National Wildlife Refuge System.	*Wilderness Act,* 16 USC 1131 et. seq.; 50 CFR 35.1 et. seq.	Not Applicable	No known Federally-owned wilderness areas are located at Site 1 or NWIRP Bethpage.
Fish and Wildlife Coordination Act					
Floodplain	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood prone areas.	*Fish and Wildlife Coordination Act*, 16 USC 661 et. seq.; Executive Order 11988; 40 CFR 6, Appendix A; 40 CFR 6.302	Not Applicable	There are no floodplains or wetlands nearby, or that would be affected by any of the removal alternatives. The appropriate state agency and U.S. Fish and Wildlife Service would be notified of activities which may impact aquatic life.
Flood Disaster Protection	Flood plain management criteria. National Flood Insurance Program.	Action that will occur in a floodplain, i.e., 100-year floodplain	The Flood Disaster Protection Act and National Flood Insurance Act (24 CFR 1909 [of 1978]; redesignated 24 CFR 59 in 1979)	Not Applicable	No floodplains or wetlands nearby, or that would be affected by, or that can affect, any of the removal alternatives.
Area affecting stream or river	Requires that activities avoid, minimize, or compensate for impacts to fish and wildlife and their habitats.	Diversion, channeling or other activity that modifies a stream or river and affects fish or wildlife and their habitat.	*Fish and Wildlife Coordination Act,* 16 USC 661 et. seq.; 40 CFR 6.302; 44 CFR 9	Not Applicable	No streams or rivers nearby, or that would be affected by any of the removal alternatives.
National Wildlife Refuge System					
Wildlife refuge	Only actions allowed under the citation may be undertaken in areas that are part of the National Wildlife Refuge System.	Area designated as part of National Wildlife Refuge System.	16 USC 668dd et. seq.; 50 CFR 27	Not Applicable	There are no known National Wildlife Refuge areas located at Site 1 or NWIRP Bethpage.
Coastal Barrier Resources Act					
Designated coastal barrier resource system	Prohibits any new Federal expenditure within the Coastal Barrier Resource System.	Activity within the Coastal Barrier Resource System.	*Coastal Barrier Resources Act* , 16 USC 3501 et. seq.	Not Applicable	Site 1 is not located within a coastal barrier resource system.
Rivers and Harbors Appropriation Act					
Navigable waterways of the United States	Meet regulatory requirements to conduct activity in navigable waterways of the United States.	Prohibits the construction of any structures, excavation, fill, or altering of any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established, without meeting established guidelines.	*Rivers and Harbors Appropriation Act* , 33 USC 401-403	Not Applicable	None of the proposed site activities will affect navigable waters.
Marine Research and Sanctuaries Act					
Ocean waters	Prohibits dumping into ocean waters of any material that would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities. Must meet regulatory requirements to conduct dumping into ocean waters.	Applies to actions that result in discharge to ocean waters.	*Marine Research and Sanctuaries Act* , 16 USC 32	Not Applicable	No wastewater streams will be discharged to the ocean.

TABLE 3-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
Migratory Bird Treaty Act					
Migratory bird area	Protects almost all species of native birds in the United States from unregulated taking which can include poisoning at hazardous waste sites.	Presence of migratory birds.	*Migratory Bird Treaty Act* , 16 USC 703	Not Applicable	There are no known migratory birds present at Site 1 or NWIRP Bethpage due to the urbanization of the immediate vicinity; however, nearby airfield may provide the transition habitat for migratory birds. This area would not be impacted by any removal activities, and current site conditions are not hazardous to migratory birds.
FEDERAL ACTION-SPECIFIC ARARs					
Clean Air Act (CAA)					
Air emissions	Ensure compliance with the Clean Air Act which regulates the various types of air emissions: mobile sources, hazardous air pollutants, acid deposition and electrical utility emissions, stationary sources, and stratospheric ozone. Requirements are based on the air quality designation of the site's location (i.e., attainment, non-attainment, unclassified, or transport) for each NAAQS, the classification of each area, the required control measures, and baseline emission estimates. Must meet specific NSPS standards for incineration, use of statutory gas turbines, and storage of petroleum liquids.	Air pollutant emissions during the response action, or during the O&M of the response action.	40 CFR 50.4 to 50.12 40 CFR 60.112 to 60.52	Relevant and Appropriate	Relevant to NTCRA Alternative 3, if selected. Alternative 3 includes SVE Containment System. CVOC vapors (e.g., TCE) in off-gas would be treated as necessary prior to emission.
Air	NAAQS specify the maximum concentration of each criteria pollutant (carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, sulfur dioxide) which is to be permitted in the ambient air, as averaged over a period of time. Requirements differ for new sources of air pollutant emissions and existing sources. Requirements also differ based on the air quality designation of the site's location (i.e., attainment, non-attainment, unclassified, or transport) (see Federal Location-Specific ARARs).	Emissions of criteria pollutants during the response action, or during the operation and maintenance of the response action. NAAQSs are not enforceable in and of themselves. Any substantive standards contained within the State Implementation Plan are, however, federally enforceable.	40 CFR 50.4 to 50.12	Relevant and Appropriate	Bethpage is located in a non-attainment area. This is not applicable to the emissions associated with the SSDs installed under the TCRA. Heavy equipment may be required for implementation if Alternative 3 is selected; however, any ancillary emissions in the industrialized and dense suburban area would not be considered a concern to current site workers. O&M of the SVE system includes pre-treatment of emissions as necessary.
Air	Site remediations are required to control emissions of organic HAP by meeting emissions limitations and work practice standards reflecting the application of maximum achievable control technology. Period inspections of equipment and continuous monitoring are required for the life of the remediation.	Emissions of hazardous air pollutants from site remediations.	40 CFR 63 Subpart GGGG NESHAPS for Site Remediation	Relevant and Appropriate	Relevant to NTCRA Alternative 3, if selected. Alternative 3 includes SVE Containment System. CVOC vapors (e.g., TCE) would be treated as necessary prior to emission. However, these standards were developed for specific, significant sources
Air	This TBC policy guides the selection of control for air strippers at groundwater sites according to the air quality status of the area of the Site (i.e., whether it is in an attainment or non-attainment area	Groundwater remediation of VOCs using air strippers.	EPA, 1989. *Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites* (OSWER Directive 9355.0-28). June 15.	Not Applicable	This TBC is not applicable. Groundwater is not being treated as part of this NTCRA. No air strippers are included as part of a removal alternative.
Clean Water Act (CWA)					
Direct discharges	Controls the direct discharge of pollutants to surface waters through the NPDES program. NPDES standards include technology-based pollutant controls, or effluent standards, governing surface water discharges.	Direct discharges to surface waters.	*Clean Water Act* , §402, 40 CFR 122	Not Applicable	There will not be a direct discharge with any of the alternatives.
Indirect discharges	Discharge must comply with local Publically Owned Treatment Works (POTW) pretreatment program, including POTW-specific pollutants, spill prevention program requirements, and reporting and monitoring requirements.	Indirect discharges of wastewater to a POTW through performance and technology-based pretreatment standards.	*Clean Water Act,* §307(b), 40 CFR 403	Relevant and Appropriate	Appropriate controls (e.g., implementation of spill prevention plans, stormwater management plans, etc.) would be implemented as appropriate to prevent indirect discharges.

TABLE 3-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
Discharge of dredge-and-fill	No discharge of dredged or fill material will be allowed unless appropriate and practicable steps are taken that minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Discharges of dredged or fill material to surface waters, including wetlands.	*Clean Water Act,* §404; 40 CFR 230; 33 CFR 320 to 330	Not Applicable	No proposed activities for the NTCRA at Site 1 include discharges of dredged or fill material into U.S. waters or wetlands.
Safe Drinking Water Act (SDWA)					
Underground injection	Regulates the subsurface emplacement of liquids through the Underground Injection Control program, which governs the design and operation of five classes of injection wells in order to prevent contamination of underground sources of drinking water. The Underground Injection Control program regulates well construction, well operation, and monitoring.	Underground injection of wastes and treated groundwater.	40 CFR 144 to 148 40 CFR 268.2	Not applicable	No injection activities are included in the NTCRA for Site 1.
Toxic Substances Control Act (TSCA)					
Use/presence of chemicals	Chemical control measures including information gathering, chemical testing, labeling, inspection, use, storage, and disposal requirements.	Use/presence of asbestos, CFCs used as aerosol propellants, hexavalent chromium, and PCBs.	*Toxic Substances Control Act* , §6; 40 CFR 700 to 766	Not Applicable	None of these chemicals would be used during the NTCRA at Site 1.
Remedial Action for PCBs	Considerations during remedial actions for PCBs in soil and groundwater.	Presence of PCBs. Remedial alternative development and remedial actions.	EPA, 1990. *Guidance on Remedial Actions for Superfund Sites with PCB Contamination.* OSWER Directive No. 9355.4-01. August.	Not Applicable	This TBC is not applicable to the NTCRA at Site 1. PCBs are not COCs for this removal action.
PCB management	Governs many aspects of PCB management, including cleanup of spills, storage, and disposal. EPA has also proposed PCB spill response regulations which utilize self-implementing, performance-based, and risk-based cleanup standards to address various types of PCB releases.	Presence of PCBs. PCB contamination below 50 ppm is not regulated by TSCA, except under special circumstances.	*Toxic Substances Control Act, §6;* 40 CFR 761	Relevant and Appropriate	PCBs are present in soil at Site 1, but would not be treated as part of any of the potential removal alternatives. PCB concentrations in soil exceed 50 ppm in areas of Site 1, but would not be encountered during intrusive activities associated with Alternative 3. However, PCB-contaminated (as determined by waste characterization) soil cuttings generated during intrusive activities and well installation would be handled accordingly.
Federal Insecticide, Fungicide, and Rodenticide Act					
Disposal of pesticides, pesticide containers, and pesticide residue	Must follow proper disposal methods.	Pesticides requiring disposal.	40 CFR 165.7 to 165.9	Not Applicable	Pesticides are not a COC at Site 1 and would not be used or generated during the selected removal action.
Labeling pesticides	Labeled per specifications to show ingredients, warnings and precautionary statements, toxicity, and directions for use (including storage and disposal methods).	Labeling requirements may apply when pesticides are considered products, and not RCRA hazardous wastes.	40 CFR 162.10	Not Applicable	Pesticides are not a COC at Site 1 and would not be used or generated during the selected removal action.
Handling pesticides	Individuals handling certain pesticides must be State or Federally approved applicators.	Use of pesticides.	40 CFR 171.4	Not Applicable	Pesticides are not a COC at Site 1 and would not be used or generated during the selected removal action.

TABLE 3-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
Resource Conservation and Recovery Act Subtitle C					
Treatment, storage, and/or disposal of hazardous waste	Design and operating specifications for hazardous waste treatment, storage, and disposal units.	Potential CERCLA remedial alternatives include but are not limited to: capping, closure with no post-closure care, closure with waste-in-place, closure of land treatment units, consolidation between units, container storage, construction of new landfill, construction of new surface impoundment, dike stabilization, incineration, land treatment, surface water control, tank storage, treatment, waste pile.	40 CFR 264	Not Applicable	Construction- and investigation-derived waste and materials from implementation of Alternatives 2 or 3 (e.g., soil cuttings, vapor condensate, and used GAC) would be characterized and managed in accordance with RCRA requirements. Considering previous investigations and remedial actions, as well as historical waste characterization of all media at the site, any derived materials or media are expected to be nonhazardous and would not be listed by the Navy. Appropriate controls would be designed for the SVE Containment System (Alternative 3), if selected.
Generation of hazardous waste	LDRs and standards for hazardous wastes placed on land. Treatment standards vary depending on the type of hazardous waste being treated and are concentration- and technology-based designed to reduce the mobility and toxicity of hazardous constituents present in hazardous wastes.	Placement of restricted hazardous wastes moved or treated outside the area of contamination.	40 CFR 268.49	Not Applicable	No media to be treated or handled at Site 1 are expected to be hazardous. Any contaminated wastes (e.g., soil cuttings, vapor condensate, and used GAC) generated during the removal action would be characterized and disposed appropriately.
Closure and post-closure of hazardous waste management unit	There are two types of potentially applicable RCRA closure schemes: clean closure and landfill closure. Clean closure involves removing or decontaminating all waste residues, contaminated equipment, and contaminated soils so that no additional care or monitoring is required, either at RCRA or CERCLA sites. Landfill closure involves leaving hazardous wastes and contaminated equipment in place, and there are requirements for the use of a final cap or cover for the unit and continued groundwater monitoring in the post-closure period.	Removal or decontamination of all waste residues, contaminated equipment, and contaminated soils so that no additional care or monitoring is required or leaving hazardous wastes and contaminated equipment in place.	40 CFR 264 Subpart G	Not Applicable	No hazardous waste management units exist onsite. No hazardous waste management units will be established onsite.
CAMUs and Temporary Units	Remediation wastes placed in Corrective Action Management Units (CAMUs) will not be subject to LDRs or other hazardous waste disposal requirements	Designation of site/facility or treatment area as CAMU or Temporary Unit (TU) to differentiate management of "remediation wastes" versus "as-generated" hazardous wastes.	EPA Final Rule: Corrective Action Management Units and Temporary Units; Corrective Action Provisions Under Subtitle C (40 CFR Parts 260, 264, 265, 268, 270 and 271)	Not Applicable	CAMU designated areas qualify for certain exemptions from RCRA Subtitle C requirements. Particularly, remediation wastes can be moved between sites within the designated area and can be treated and replaced on site without triggering LDRs. The NTCRA addresses impacted soil gas, which would be contained and/or treated onsite by the SVE Containment System. SVE vapor condensate and the used GAC from the system would be handled: The GAC would be disposed (or recycled) offsite at the conclusion of the removal action if Alternative 3 is selected. The vapor condensate would be characterized and disposed appropriately as necessary.
Groundwater monitoring of hazardous waste land disposal units	RCRA groundwater monitoring standards, which involve the use of monitoring wells to detect the presence of contaminants in underlying aquifers, are applicable when a Superfund response involves the creation of a new land disposal unit or the remediation of an existing land disposal unit.	Groundwater monitoring of hazardous waste land disposal units.	40 CFR 264 Subpart F	Not Applicable	Land Disposal units are not included in the remedial alternatives.
Staging piles	Design and operating requirements for an accumulation of solid, non-flowing remediation waste. Must be designed to minimize the release of hazardous constituents from the pile (liners, covers), cannot operate for more than 2 years, must facilitate a remedy, must be closed by removing all contaminated materials.	Stockpiling of solid, non-flowing remediation wastes	40 CFR 264.554	Not Applicable	Any or all solid construction-derived material or investigation-derived waste will be managed immediately via appropriate characterization and disposal as necessary or reuse onsite. There will be no stockpiling of material with any alternative selected.

TABLE 3-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
Waste piles	Hazardous waste that is put into piles is subject to LDRs. A double liner with leachate collection system is required, although a single liner may be used with EPA approval.	Stockpiled non-containerized accumulation of hazardous soil	40 CFR 264 Subpart L	Not Applicable	Any or all solid construction-derived material or investigation-derived waste will be managed via appropriate characterization and subsequent disposal as necessary or reuse onsite or onbase. There will be no stockpiling of material with any alternative selected.
Offsite disposal of hazardous wastes	Administrative standards for hazardous wastes sent off-site for further management. Administrative RCRA standards include the obligation to obtain permits and keep various records at all hazardous waste treatment, storage, and disposal facilities; and the requirement to include a hazardous waste manifest when sending hazardous wastes off-site.	Off-site disposal of hazardous wastes.	40 CFR 262.10 through .58	Not Applicable	Hazardous waste would not be generated at Site with any removal alternative. Any contaminated wastes (e.g., soil cuttings, vapor condensate, and used GAC) generated during the removal action would be characterized and disposed appropriately.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)					
Waste	CERCLA waste transferred offsite must be placed in a facility operating in compliance with RCRA (or other applicable Federal or State) requirements. Under the "Off-Site Rule", the EPA Region determines the acceptability of each off-site waste disposal facility to accept CERCLA wastes	Off-site disposal of CERCLA wastes.	40 CFR 300.440	Not Applicable	Applies to aqueous IDW generated at an NPL site during LTM and solid material if deemed IDW rather than construction-derived material during an implemented intrusive [drilling] remedy. NWIRP Bethpage is not on the NPL list. Off-Site Rule facility-qualification would be confirmed.
Solid Waste Disposal Act					
Solid waste	Establishes procedures and minimum requirements for land disposal of solid waste.	Solid wastes stored or disposed offsite requiring compliance with RCRA permitting regulations	Solid Waste Disposal Act Subtitle D (42 USC §6901 et seq.)	Relevant and Appropriate	If 'waste' is removed from the site. If Alternative 3 is selected, the SVE vapor condensate would be characterized and disposed appropriately as necessary. The GAC treatment unit (i.e., the GAC) would be characterized and disposed/recycled appropriately at the end of the removal action.
Solid waste	Establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment.	Onsite land filling of contaminated soils	40 CFR Part 257	Not Applicable	None of the proposed removal actions involve onsite landfilling of any media. If Alternative 3 is selected, the SVE vapor condensate would be characterized and disposed appropriately as necessary. The GAC treatment unit (i.e., the GAC) would be characterized and disposed/recycled appropriately at the end of the removal action.
Solid waste	Characterization of wastes generated during a remedial action would be conducted to determine if such wastes are hazardous (e.g. contaminated PPE, equipment, wastewater) or excluded under 40 CFR 261.4. Determine if the waste is hazardous by testing using prescribed methods or by applying generator knowledge based on information regarding material or processes used. If waste is hazardous, it must be managed in accordance with the hazardous waste regulations.	Generation of solid wastes as defined in 40 CFR 261.2	40 CFR 261.2 and 40 CFR 262.11	Relevant and Appropriate	All materials deemed to be 'waste' rather than construction-derived material would be characterized and disposed appropriately (see above). PPE and equipment are not anticipated to be waste for any of the removal alternatives. If Alternative 3 is selected, the SVE vapor condensate would be characterized and disposed appropriately as necessary. The GAC treatment unit (i.e., the GAC) would be characterized and disposed/recycled appropriately at the end of the removal. Hazardous waste would not be generated during the NTCRA at Site 1.
Solid waste	Establishes standards for generators managing hazardous waste. Establishes specific criteria, which include: marked with "hazardous waste" or other words identifying contents, labeled with the date accumulation began, have training, have emergency response procedures in place. In accordance with state regulations.	Hazardous waste is held temporarily onsite prior to off-site disposal. Accumulation of hazardous wastes onsite for longer than 90 days would be subject to RCRA requirements for storage facilities.	40 CFR 262.11	Relevant and Appropriate	If hazardous waste would be generated and removed from site, then appropriate labeling and management requirements would be met. However, the proposed removal alternatives would not generate hazardous waste.
Solid waste	Prior to transportation, containers would be packaged, labeled, marked, and placarded in accordance with RCRA and Department of Transportation requirements.	Offsite disposal of hazardous waste.	40 CFR 262.30 through 33	Not Applicable	Hazardous waste would not be generated by the proposed removal alternatives. Any contaminated wastes (e.g., soil cuttings, vapor condensate, and used GAC) generated during the removal action would be characterized and disposed appropriately.
Occupational Safety and Health Administrative (OSHA) Requirements					
Personnel	Regulations provide occupational safety and health requirements applicable to workers engaged in onsite field activities.	Site workers during construction and operation of remedial activities.	20 CFR 1910, 1926, and 1904	Applicable	Implementation of any alternative would require site workers to be in compliance with OSHA.

TABLE 3-1
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SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
Materials Management					
Fuel and oil	When cumulative onsite bulk storage volume of fuel and/or oil is greater than 1,320 gallons, comprised of containers >55 gallons, the >55-gallon-containers (e.g., drums or tanks) must be secondarily contained, inspected routinely, have a SPCC plan prepared, and meet other specific Spill Prevention Control and Countermeasure (SPCC) requirements.	Fuels and oil stored on site in containers >55 gallons when cumulative onsite bulk storage volume is >1,320 gallons.	40 CFR 112	Not Applicable	Fuel container capacities for the NTCRA are not anticipated to be above these volumes. Any fuels and oil for the NTCRA implementation would be stored in appropriate containers and controlled areas as appropriate. An SPCC Plan would be prepared under 40 CFR 112 and implemented. If Alternative 3 is selected, the SVE Containment System would be powered by onsite electricity.
Transportation					
Hazardous Materials Transportation	Safe and secure transportation of hazardous materials in commerce.	Transportation of hazardous materials offsite.	49 CFR 107 49 CFR 171-179	Relevant and Appropriate	Similar to solid waste regulations above, all materials deemed to be 'waste' rather than construction-derived material would be characterized and disposed appropriately. Hazardous waste would not be generated at Site 1 for any of the NTCRA alternatives.

Acronyms and Abbreviations

APU - air purifying unit
CFC - chlorofluorocarbon
CFR - Code of Federal Regulations
COC - Chemical of Concern
CVOC - chlorinated volatile organic compounds
EPA - U.S. Environmental Protection Agency
GAC - granular activated carbon
NTCRA - non-time-critical removal action
NWIRP - Naval Weapons Industrial Reserve Plant
O&M - operation and maintenance; OM&M - O&M and monitoring
PCB - polychlorinated biphenyl
PCE - tetrachloroethene
ppm - parts per million
RCRA - Resource Conservation and Recovery Act of 1976
SSD - sub-slab depressurization
SVE - soil vapor extraction
SVPM - soil vapor pressure monitor
TBC - To Be Considered
TCA - 1,1,1-trichloroethane
TCE - trichloroethene
TCRA - time-critical removal action
USC - U.S. Code

TABLE 3-2
NEW YORK STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
(NEW YORK STATE STANDARDS, CRITERIA, AND GUIDELINES [SCGs])
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
NY STATE CHEMICAL-SPECIFIC ARARs					
NY Air Standards					
Air	Air Quality Standards (based on areal Air Quality Classification [also see Location-Specific ARARs]) for sulfur dioxide, particulates, carbon monoxide, photochemical oxidants, hydrocarbons (non-methane), nitrogen dioxides, fluorides, beryllium, and hydrogen sulfide.	Direct source emissions that may affect air quality based on Air Quality Classification-specific Air Quality Standards.	6 NYCRR 256 and 257	Not Applicable	NWIRP Bethpage is in a region of Nassau County, NY, with an Air Quality Classification of Level III (6 NYCRR 287.3) (Air Quality Classification determines the applicable particulates Air Quality Standard -- all other Standards are independent of Classification). The values are meant to be representative for the geographic region, not the site, and air monitoring is performed by NYSDEC state-wide (nearest monitoring locations to NWIRP Bethpage are at Eisenhower Park and Hempstead within Nassau County).
NYSDOH Soil Vapor Intrusion Guidance					
Indoor Air, Soil Vapor, Ambient Air	TBC guidance from the New York State Department of Health (NYSDOH) provides evaluation framework, mitigation techniques, sampling protocols, and screening values applicable to impacted soil gas and indoor air.	Impacted soil vapor or indoor air.	NYSDOH, 2006. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. Center for Environmental Health, Bureau of Environmental Exposure Investigation. October.	To Be Considered	The TBC guidance specifies a risk-based benchmark value for indoor air TCE concentrations at 5 $\mu g/m^3$ to be protective of both residential adults and children. The benchmark value for sub-slab soil vapor TCE concentrations at 250 $\mu g/m^3$, above which indoor air is likely to be impacted adversely under default conditions. Other concentrations are applicable depending on site conditions as defined in the Decision Matrices provided in the guidance. The indoor air benchmark value for PCE and TCA is 100 $\mu g/m^3$, and the sub-slab benchmark value for PCE and TCA is 1,000 $\mu g/m^3$. Removal action cleanup levels would likely be based on these benchmark values.
NY Groundwater Standards					
Groundwater and Surface Water	Water classifications provide for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the water, and take into account the use and value of public water supplies, propagation of fish, shellfish and wildlife, recreation in and on the water, and agricultural, industrial and other purposes, including navigation.	Standards are used to protect the public health or welfare and enhance water quality.	6 NYCRR 609, 700-704	Not Applicable	The NTCRA at Site 1 addresses CVOC-impacted soil gas, which are not affecting groundwater or surface water. Any contaminated wastes (e.g., decontamination water or vapor condensate) generated during the removal action would be characterized and disposed appropriately.
NY Public Water Supply Regulations					
Groundwater and Surface Water Resources	Maximum Contaminant Levels (MCLs) and monitoring requirements for public water supplies, water supply well construction requirements, water quality treatment districts, and bottled and bulk water standards.	Potential site contamination impact on public water supply to be addressed by, or potentially caused by, environmental action.	10 NYCRR 5	Not Applicable	The NTCRA at Site 1 addresses CVOC-impacted soil gas, which are not affecting groundwater or surface water. Any contaminated wastes (e.g., decontamination water or vapor condensate) generated during the removal action would be characterized and disposed appropriately.
NYSDEC Division of Fish, Wildlife, and Marine Resources					
Sediment	Sediment screening values and criteria for the protection of human health, aquatic life, wildlife, fish flesh tainting, and aesthetics.	Sediment investigation or environmental action for contaminated sediment.	NYSDEC, 1999. *Technical Guidance for Screening Contaminated Sediments*. NYSDEC, Division of Fish, Wildlife, and Marine Resources. January 25.	Not Applicable	Standards would apply for removal actions associated with sediment. This is not applicable for the NTCRA at Site 1.

TABLE 3-2
NEW YORK STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
(NEW YORK STATE STANDARDS, CRITERIA, AND GUIDELINES [SCGs])
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
NYSDEC TAGM No. 4046: Soil Cleanup Objectives and Cleanup Levels					
Soil	TBC guidance for soil cleanup levels -- at individual Federal Superfund, State Superfund, NY Environmental Quality Bond Act of 1986 Title 3, and Responsible Party (RP) sites -- considering human health, protection of groundwater/drinking water quality, background values, and detection limits.	Soil cleanup based on values derived from TAGM 4046.	NYSDEC, 1994. *TAGM No. 4046: Determination Of Soil Cleanup Objectives and Cleanup Levels*. Division of Environmental Remediation (formerly Hazardous Waste Remediation). January 24.	Not Applicable	This TBC is not applicable for the NTCRA at Site 1. The NTCRA for Site 1 addresses CVOCs in soil gas, as measured by soil gas concentrations -- not by soil concentrations.
NY Spill Technology and Remediation Series (STARS), Petroleum-Contaminated Soil Guidance					
Petroleum-Contaminated Soil	TBC guidance for handling, disposal, and/or reuse of non-hazardous petroleum-contaminated soils. Screening values for handling and reuse based on federal RCRA (40 CFR 261) and UST (40 CFR Section 280.12) regulations, protection of groundwater, human health, and nuisance. Soils which meet beneficial use conditions are no longer a solid waste (NYCRR Part 360-1.2[a][4])	Petroleum-contaminated soil encountered during environmental action.	NYSDEC, 1992. *STARS No. 1: Petroleum Contaminated Soil Guidance Policy*. Division of Environmental Remediation (formerly Hazardous Waste Remediation) August.	Not Applicable	This TBC is not applicable to the NTCRA at Site 1, as the COCs are CVOCs in soil vapor.
NY STATE <u>LOCATION</u>-SPECIFIC ARARs					
NY Air Quality Area Classifications					
Air	Establishes Air Quality Area Classification to determine applicable air standards.	Air standards apply to particular air quality area classification.	6 NYCRR 287	Applicable.	NWIRP Bethpage is within a defined region in Nassau County, NY, which has an Air Quality Classification of Level III (6 NYCRR 287.3).
NY Groundwater Standards					
Groundwater	Water classifications for areas of Nassau County, NY.	Standards are used to protect the public health or welfare and enhance water quality.	6 NYCRR 885	Not Applicable	The NTCRA at Site 1 addresses CVOC-impacted soil gas, which are not affecting groundwater. Any contaminated wastes (e.g., decontamination water or vapor condensate) generated during the removal action would be characterized and disposed appropriately.
New York Freshwater Wetlands Act					
Wetland	Preserve, protect, and conserve freshwater wetlands (and the benefits derived therefrom) to prevent the despoliation and destruction of freshwater wetlands, and to regulate use and development of such wetlands to secure the natural benefits of freshwater wetlands, consistent with the general welfare and beneficial economic, social, and agricultural development.	Activities within or adjacent to a state-regulated wetlands requires a permit or letter of approval.	NY ECL Article 24; NY ECL 71 Title 23 (enforcement of Article 24). 6 NYCRR 662 - 664.	Not Applicable	No state regulated wetlands are present or adjacent to Site 1 or NWIRP Bethpage. The NTCRA at Site 1 would not affect wetlands.
NY Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern					
Critical habitat of/or presence of an endangered or threatened species	Identify activities that may affect listed species. Actions must not threaten the continued existence of a listed species. Actions must not destroy critical habitat.	Presence of species or habitat listed as endangered or threatened.	6 NYCRR 182	Not Applicable	No endangered species are present at Site 1 or NWIRP Bethpage; however, migratory birds occasionally move through the area, but are not known to utilize Site 1.
NY Wild, Scenic, and Recreational Rivers System Act					
Rivers	Preservation of State rivers in free-flowing condition and protection for the benefit and enjoyment of present and future generations.	Activities within or adjacent to a state-regulated river requires a permit or letter of approval.	6 NYCRR 666	Not Applicable	NWIRP Bethpage is not in close vicinity to a river and there would be no activities or discharges to a river for the NTCRA at Site 1.

TABLE 3-2
NEW YORK STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
(NEW YORK STATE STANDARDS, CRITERIA, AND GUIDELINES [SCGs])
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
NY Inactive Hazardous Waste Disposal Site Regulations					
Contaminated Site	NY remediation program for sites listed on the NYS Registry or the NPL, or that are being addressed by the U.S. DOD or DOE.	Navy ERP Site	6 NYCRR 375	Applicable	NWIRP Bethpage is not on the NPL, but is listed on the NYS Registry and is a DOD-owned site.
NY State Environmental Quality Review					
Historic Place	Protect historic buildings, structures, facilities, sites or districts or prehistoric sites listed on the National Register of Historic Places or listed on the State Register of Historic Places		6 NYCRR 617	Not Applicable	Site 1 is not located within an area on the National Register or State Register of Historic Places.
NY STATE ACTION-SPECIFIC ARARs					
New York Air Pollution Control Act					
Air	Maintain a reasonable degree of purity of the air resources of the state, which shall be consistent with the public health and welfare and the public enjoyment hereof, the industrial development of the state, the propagation and protection of flora and fauna, and the protection of physical property and other resources, and to that end to require the use of all available practical and reasonable methods to prevent and control air pollution in the state of New York.	Air pollutant emissions during the response action, or during the O&M of the response action.	NY ECL Article 19	Relevant and Appropriate	NYSDOH already determined that the SSDs installed under the TCRA are not a significant direct source of air contamination requiring compliance with Air Standards. If selected, the NTCRA under Alternative 3 (SVE) might include monitoring levels of CVOCs during O&M.
New York Air Pollution Control Regulations					
Air and Air Emissions	Ensure compliance with the New York State Air Pollution Control Act (NY ECL Article 19). Construction, operation, and/or management of indirect and direct air emissions in accordance with Air Quality Classifications and Air Quality Standards, reporting, and permitting.	Air pollutant emissions during the response action, or during the O&M of the response action.	6 NYCRR 200 - 257	Relevant and Appropriate	NYSDOH already determined that the SSDs installed under the TCRA are not a significant direct source of air contamination requiring compliance with Air Standards. If selected, the NTCRA under Alternative 3 (SVE) might include monitoring of CVOCs during O&M.
NYSDOH Soil Vapor Intrusion Guidance					
Indoor Air, Soil Vapor, Ambient Air	TBC guidance from the New York State Department of Health (NYSDOH) provides evaluation framework, mitigation techniques, sampling protocols, and screening values applicable to impacted soil gas and indoor air.	Investigation and/or environmental action for contaminated soil / soil vapor and/or indoor air.	NYSDOH, 2006. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. Center for Environmental Health, Bureau of Environmental Exposure Investigation. October.	To Be Considered	This TBC guidance specifies tiered-investigation approaches, mitigation techniques, and reporting requirements for each. The previous TCRA and the NTCRA evaluated herein consider all aspects of this guidance. The intent of certain procedural and certification requirements would also be considered.
New York Uniform Procedures					
Permitting	Establishes uniform review procedures for major regulatory programs. Procedures are provided for coordinating permitting for a project requiring one or more NYSDEC permits.	Remedial action requiring one or more NYSDEC permits	NY ECL Article 70	Relevant and Appropriate	NYSDEC permits would not be required for the NTCRA performed under CERCLA. However, any removal action would meet the intent of uniform procedures and permitting requirements. If Alternative 3 is selected, the SVE Containment System would not be a significant direct source, and the treated air emissions would be minimal compared to ambient conditions.

TABLE 3-2
NEW YORK STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
(NEW YORK STATE STANDARDS, CRITERIA, AND GUIDELINES [SCGs])
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
New York Solid and Hazardous Waste Management Laws					
Solid and Hazardous Waste	Assure full consideration of all aspects of planning for proper and effective solid and hazardous waste disposal, coordinated, so far as practicable, with other related state, regional and local planning activities, and consistent with the protection of the public health, and effect maximum resource recovery from solid waste on a cost-effective basis.	Solid and/or hazardous waste management during the remedial action.	NY ECL Article 27	Relevant and Appropriate	Construction- and investigation-derived waste and materials from implementation of Alternatives 2 or 3 would be characterized and managed in accordance with RCRA requirements. Considering previous investigations and remedial actions, as well as historical waste characterization of all media at the site, any derived materials or media are expected to be nonhazardous and would not be listed by the Navy. However, any wastes to be managed would be characterized and disposed appropriately.
New York Waste Management Facilities Rules					
Solid Waste	Provides standards for solid waste management facilities.	Solid waste management facility.	6 NYCRR 360	Not Applicable	NWIRP currently has a RCRA permit. The NTCRA at Site 1 addresses CVOC-impacted soil gas. If selected, Alternative 3 would generate soil cuttings from soil gas sampling and SVE well installation, and soil vapor condensate and used GAC (for off-gas pretreatment) from the SVE Containment System operation.
New York Rules for Siting Industrial Hazardous Waste Facilities					
Hazardous Waste Facility	Provides evaluation criteria for siting new industrial hazardous waste facilities.	New hazardous waste facility.	6 NYCRR 361	Not Applicable	Not applicable to the NTCRA for soil gas at Site 1.
New York Waste Transport Permit Regulations					
Waste Transport		Generation of solid wastes.	6 NYCRR 364	Applicable	Offsite transport of contaminated solid or aqueous wastes or treatment residuals would require compliance with these regulations.
New York General Hazardous Waste Management System Regulations					
Hazardous Waste	Definitions and Requirements for generators, transporters, or owners or operators of treatment, storage, or disposal facilities.	Generation of solid wastes.	6 NYCRR 370	Applicable	Construction- and investigation-derived waste and materials from implementation of Alternatives 2 or 3 would be characterized and managed in accordance with these requirements. Considering previous investigations and remedial actions, as well as historical waste characterization of all media at the site, any derived materials or media are expected to be nonhazardous and would not be listed by the Navy. However, any wastes to be managed would be characterized and disposed appropriately.
New York Identification and Listing of Hazardous Wastes Regulations					
Hazardous Waste	Characterization and identification of wastes.	Generation of solid wastes.	6 NYCRR 371	Applicable	Construction- and investigation-derived waste and materials from implementation of Alternatives 2 or 3 would be characterized and managed in accordance with these requirements. Considering previous investigations and remedial actions, as well as historical waste characterization of all media at the site, any derived materials or media are expected to be nonhazardous and would not be listed by the Navy. However, any wastes to be managed would be characterized and disposed appropriately.

TABLE 3-2
NEW YORK STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
(NEW YORK STATE STANDARDS, CRITERIA, AND GUIDELINES [SCGs])
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
New York Hazardous Waste Manifest System Regulations					
Waste Transport	Standards for generators and transporters of hazardous waste and standards for generators, transporters, and treatment, storage or disposal facilities relating to the use of the manifest system and its record keeping requirements	Generation, transport, and disposal of solid wastes.	6 NYCRR 372	Applicable	Manifests would be required for off-site disposal/treatment of residuals.
New York Hazardous Waste Treatment, Storage, and Disposal Facility Permitting Requirements					
Hazardous Waste	Permit requirements and construction and operation standards for the treatment, storage and disposal of hazardous waste.	Hazardous waste management facility located partially or wholly within NY.	6 NYCRR 373-1	Not Applicable	The NTCRA at Site 1 addresses CVOC-impacted soil gas. Any contaminated water or soils generated during the removal action would be characterized and disposed appropriately.
New York Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities					
Hazardous Waste	Standards which define the acceptable management of hazardous waste.	Hazardous waste management facility located partially or wholly within NY.	6 NYCRR 373-2	Not Applicable	The NTCRA at Site 1 addresses CVOC-impacted soil gas. Any contaminated water or soils generated during the removal action would be characterized and disposed appropriately.
New York Interim Status Standards for Owners and Operators of Hazardous Waste Facilities					
Hazardous Waste Facility	Standards that define the acceptable management of hazardous waste during the period of interim status and until certification of final closure or, if the facility is subject to post-closure requirements, until post-closure responsibilities are fulfilled	Hazardous waste management facility located partially or wholly within NY.	6 NYCRR 373-3	Not Applicable	The NTCRA at Site 1 addresses CVOC-impacted soil gas. Any contaminated wastes (e.g., soil cuttings, vapor condensate, and used GAC) generated during the removal action would be characterized and disposed appropriately.
New York Standards for Managing Specific Hazardous Wastes and Hazardous Waste Management Facilities					
Recyclable Waste Materials	Requirements for management of specific recyclable materials.	Hazardous waste management facility located partially or wholly within NY.	6 NYCRR Part 374	Not Applicable	Any waste management (i.e., disposal efforts) for the NTCRA for Site 1 would not include recovery.
New York Rules for Inactive Hazardous Waste Disposal Sites					
Removal Action / Evaluation or Remedial Action / Evaluation	NYSDEC's Inactive Hazardous Waste Site Program provides framework for remedial/removal alternative evaluation and selection.	Hazardous waste management facility located partially or wholly within NY.	6 NYCRR Part 375	Relevant and Appropriate	Navy documentation would be submitted for State review and concurrence. NWIRP Bethpage corrective action measures are addressed under an existing RCRA permit, although Navy (lead agency) environmental actions (e.g., the TCRA and this NTCRA) are performed under the CERCLA framework. NWIRP Bethpage is not on the NPL, but is on the NYS Registry.
Removal Action / Evaluation or Remedial Action / Evaluation	NYSDEC's Inactive Hazardous Waste Site Program provides framework for remedial/removal alternative evaluation and selection.	Environmental action evaluation, selection, and planning.	NYSDEC, 1990. *TAGM No. 4030: Selection of Remedial Actions At Inactive Hazardous Waste Sites*. Division of Environmental Remediation. May 15.	To Be Considered	Navy documentation would be submitted for State review and concurrence. NWIRP Bethpage corrective action measures are addressed under an existing RCRA permit, although Navy (lead agency) environmental actions (e.g., the TCRA and this NTCRA) are performed under the CERCLA framework. NWIRP Bethpage is not on the NPL, but is on the NYS Registry. The hierarchy of NYSDEC's preferred remedial technologies as defined in the TBC guidance is as follows: (1) Destruction, (2) Separation/ treatment, (3) Solidification/chemical fixation, and (4) Control and isolation.
New York Land Disposal Restrictions Regulations					
Waste Disposal	Regulates the disposal of contaminated soil/waste.	Disposal of waste.	6 NYCRR Part 376	Applicable	Wastes and materials resulting from the NTCRA at Site 1 are not anticipated to be hazardous wastes. Any contaminated wastes (e.g., soil cuttings, vapor condensate, and used GAC) generated during the removal action would be characterized and disposed appropriately.

TABLE 3-2
NEW YORK STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
(NEW YORK STATE STANDARDS, CRITERIA, AND GUIDELINES [SCGs])
SITE 1 EE/CA, NWIRP BETHPAGE, NEW YORK

MEDIA	REQUIREMENT	PREREQUISITE	CITATION	ARAR DETERMINATION	COMMENT
New York Rules on Hazardous Waste Program Fees					
Cleanup Fees	Fees for environmental actions and waste disposal or treatment.	Environmental action at a site.	6 NYCRR Parts 483 and 484	Not Applicable	No hazardous waste program fees are payable related to cleanup, remediation, or corrective action activities. However, waste transporter program fees would be required for offsite disposal of wastes or treatment residuals.
New York Water Pollution Control Act					
Groundwater or Surface Water	Maintain reasonable standards of purity of the waters of NY consistent with public health and public enjoyment thereof, the propagation and protection of fish and wild life (including birds, mammals and other terrestrial and aquatic life), and the industrial development of the state. Require the use of all known available and reasonable methods to prevent, abate, and control the pollution of the waters of NY.	Groundwater or surface water contamination from point and nonpoint source pollution. Discharge to groundwater or surface water. Petroleum bulk storage.	NY ECL Article 17	Not Applicable	The NTCRA for Site 1 does not address contamination in groundwater or surface water, nor does it include discharges to groundwater or surface water. Any contaminated wastes (e.g., soil cuttings, vapor condensate, and used GAC) generated during the removal action would be characterized and disposed appropriately.
Bulk Storage of Petroleum	Maintain reasonable standards of purity of the waters of NY consistent with public health and public enjoyment thereof, the propagation and protection of fish and wild life (including birds, mammals and other terrestrial and aquatic life), and the industrial development of the state. Require the use of all known available and reasonable methods to prevent, abate, and control the pollution of the waters of NY.	• Cumulative petroleum bulk storage in containers greater than 55 gallons equal to or greater than 1,200 gallons. • 110 gallon capacity tank for which greater than 11 gallons is below ground surface.	NY ECL Article 17, Title 10 (17-1001 through 17-1017)	Not Applicable	This would applies to applicable volumes of fuels and oil stored onsite to run heavy equipment during construction, or operation of the selected technology equipment (e.g., SVE blowers for the SVE Containment System under Alternative 3). However, any fuel container capacities for the NTCRA are not anticipated to be above these volumes. Any fuels and oil for the NTCRA implementation would be stored in appropriate containers and controlled areas as appropriate. A Spill Prevention Control and Countermeasure (SPCC) Plan would be prepared under 40 CFR 112 and implemented. If Alternative 3 is selected, the SVE Containment System would be powered by onsite electricity.
New York Water Classifications and Quality Standards					
Groundwater and Surface Water	Water classifications provide for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the water, and take into account the use and value of public water supplies, propagation of fish, shellfish and wildlife, recreation in and on the water, and agricultural, industrial and other purposes, including navigation.	Standards are used to protect the public health or welfare and enhance water quality.	6 NYCRR 609 and 700 through 704	Not Applicable	The NTCRA at Site 1 addresses CVOC-impacted soil gas, which are not affecting groundwater or surface water. Any contaminated aqueous wastes (e.g., decontamination water or vapor condensate) generated during the removal action would be characterized and disposed appropriately.
New York Regulations on State Pollutant Discharge Elimination System					
Discharge to Surface Water	NY State program for control of wastewater and stormwater discharges in accordance with the federal Clean Water Act.	SPDES Permit would be required for discharges to surface waters.	6 NYCRR 750	Not Applicable	The NTCRA for Site 1 does not it include direct discharges to surface water. Any contaminated aqueous wastes (e.g., decontamination water or vapor condensate) generated during the removal action would be characterized and disposed appropriately.

Acronyms and Abbreviations

NY - New York; NYS - New York State
NYCRR - NY Code, Rules, and Regulations
NY ECL - NY 'Environmental Conservation' Consolidated Laws
NYSDOH - NYS Department of Health
NYSDEC - NYS Department of Environmental Conservation
APU - air purifying unit
CVOC - chlorinated volatile organic compounds
GAC - granular activated carbon
NTCRA - non-time-critical removal action
NWIRP - Naval Weapons Industrial Reserve Plant
O&M - operation and maintenance; OM&M - O&M and monitoring
PCE - tetrachloroethene
RCRA - Resource Conservation and Recovery Act of 1976
SPDES - State Pollution Discharge Elimination System
SSD - sub-slab depressurization
STARS - Spills Technology and Remediation Series
SVE - soil vapor extraction
TAGM - Technical and Administrative Guidance Memorandum
TBC - To Be Considered
TCA - 1,1,1-trichloroethane
TCE - trichloroethene
TCRA - time-critical removal action
UST - underground storage tank
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980

TABLE 4-1
EVALUATION OF REMOVAL ACTION ALTERNATIVES
SITE 1 EE/CA
NWIRP BETHPAGE, NEW YORK

Alternative	Description	Effectiveness	Ease of Implementation	Cost			
				Capital Cost	Future Costs		Total Cost of Alternative *(2009 Dollars)*
					OM&M and/or Periodic Future Costs	Present Value (2009) Future Costs	
Alternative 1							
No Action	No removal work will be performed. The site will be left as it currently exists. Only Five-Year Reviews would be performed to review site protectivenss.	This alternative would not be effective. It would not be protective of human health, would not comply with ARARs, and would not achieve the RAOs.	This alternative would be easy to implement since there is no action associated with this alternative other than conducting Five-Year Reviews for an indeterminate timeframe greater than 30 years.	$0	*No OM&M* *Periodic Costs:* *$24,000 every 5 years*	$93,000 (30-Year Timeframe)	**$93,000**
Alternative 2							
Long-Term OM&M of Engineering Controls	OM&M for offsite engineering controls (exposure removal and exposure reduction via APUs and SSDs installed during previous TCRA).	This alternative would be effective because it removes the exposure route via sealing cracks and depressurizing sub-slab space with SSDs as necessary, and decreases any potential exposure concentrations with the APUs. However, Alternative 2 is expected to take over 30 years to meet RAOs. Alternative 2 would rely on natural attenuation of CVOCs in soil vapor to meet the RAOs. This alternative is expected to comply with ARARs.	This alternative would be easy to implement. Engineering controls installed during previous TCRA. Soil gas and air sampling is a routine activity that is easily completed by experienced field personnel. Controls and Five-Year Reviews for an indeterminate timeframe greater than 30 years.	$24,000	*OM&M:* *Year 1 - $165,000* *Year 2 - $110,000* *Annually* *Years 3-30 - $107,000* *Periodic Costs:* *$29,000 every 5 years* *Year 30 - $17,000*	$2.4M (30-Year Timeframe)	**$2.4M**
Alternative 3							
SVE Containment System, Engineering Controls, OM&M	Continued O&M for offsite engineering controls (exposure removal and exposure reduction via previously installed APUs and SSDs) and installation and OM&M for SVE Containment System (treatment).	This alternative would be effective because it would provide the same effectiveness as Alternative 2, yet also provide the containment, capture, and treatment elements of the SVE Containment System, which would shorten the timeframe to meet RAOs. This alternative is expected to comply with ARARs.	The installation and O&M of the SVE system increases the level of difficulty for implementation. However, this alternative would be moderately easy to implement considering SVE systems are a common remedial technology used at many sites. Qualified contractors, resources, and materials would be available. Soil gas and air sampling methodology are standardized.	$1.2M	*OM&M:* *Year 1 - $272,000* *Year 2 - $172,000* *Annually* *Years 3-5 - $80,000* *Periodic Costs:* *Year 3 -$17,000* *Year 5 - $90,000*	$760,000 (5-Year Timeframe)	**$2M**

Notes and Abbreviations

Implementation Cost - Direct and indirect capital costs (when applicable, includes Year 0 startup and operating cost)
Future Periodic Costs - Annual OM&M, Five-Year Reviews, etc.
Present Value - Future costs reverted to current year (2009) dollars.
APU - air purifying unit
ARAR - Applicable or Relevant and Appropriate Requirement
CVOC - chlorinated volatile organic compound
O&M - operation and maintenance
OM&M - O&M and monitoring
RAO - Removal Action Objective
SVE - soil vapor extraction
SSD - sub-slab depressurization
TCRA - Time-Critical Removal Action

TABLE 5-1
COMPARISON OF REMOVAL ACTION ALTERNATIVES
SITE 1 EE/CA
NWIRP BETHPAGE, NEW YORK

Alternative	Effectiveness	Ease of Implementation	Cost
Alternative 1			
No Action	**None** Not protective. Does not comply with ARARs.	**Easy** Nothing to implement. Five-Year Reviews would be performed in perpetuity.	**Low** $93,000 Total PV Cost evaluated over 30-year period for Five-Year Reviews.
Alternative 2			
Long-Term OM&M of Engineering Controls	**Moderate** Reduces risk by minimizing exposure route and reducing potential exposure concentrations with the engineering controls (APUs and SSDs); however, would take a longer timeframe to meet RAOs. Relies on an uncertain natural attenuation to complete. Protectiveness of Alternative 2 is essentially equivalent to Alternative 3, but Alternative 3 is more aggressive and more reliable. The APUs and SSDs in the residential area (private property) are not in constant control of the Navy for reliable O&M. Alternative 2 potentially could cause public concern without the additional treatment technology provided with Alternative 3.	**Easy** OM&M of current engineering controls (APUs and SSDs). Sampling using established methodology; however, this alternative would take at least 30 years to complete. Minimal administration beyond normal project management and data tracking.	**High** $2.4M Total PV Cost evaluated over 30-year period. No implementation cost. Extensive future periodic costs for monitoring, reporting, and management -- estimated to be longer than 30 years.
Alternative 3			
SVE Containment System, Engineering Controls, and OM&M	**High** High confidence of short and long-term effectiveness. Compliance with ARARs and likely more protective than Alternative 2. More reliable than Alternative 2. Because of this higher effectiveness, Alternative 3 is likely to be more accepted by the public than Alternative 2.	**Moderate** More difficult to implement than Alternative 2. Requires installation and O&M of SVE Containment System. However, relatively easy to implement using a robust work plan and experienced specialty contractors. Only operates for approximately 5 years. Slightly more administration required, but mostly within normal project management and data tracking. OM&M of SVE Containment System and engineering controls (APUs and SSDs) using established methodology.	**High** $2M Total PV Cost evaluated over 5-year period. Implementation- / capital-cost-intensive. Action complete estimated after 5 years. However, initial annual O&M is more costly as compared to Alternative 2.

Notes and Abbreviations

Implementation Cost - Direct and indirect capital costs (when applicable, includes Year 0 startup and operating cost)
Future Periodic Costs - Annual OM&M, Five-Year Reviews, etc.
Total PV Cost - Total Present Value Cost - Sum of implementation cost and the PV of the periodic future costs reverted to current year (2009) dollars.
APU - air purifying unit
ARAR - Applicable or Relevant and Appropriate Requirement
O&M - operation and maintenance
OM&M - O&M and monitoring
RAO - Removal Action Objective
SVE - soil vapor extraction
SSD - sub-slab depressurization

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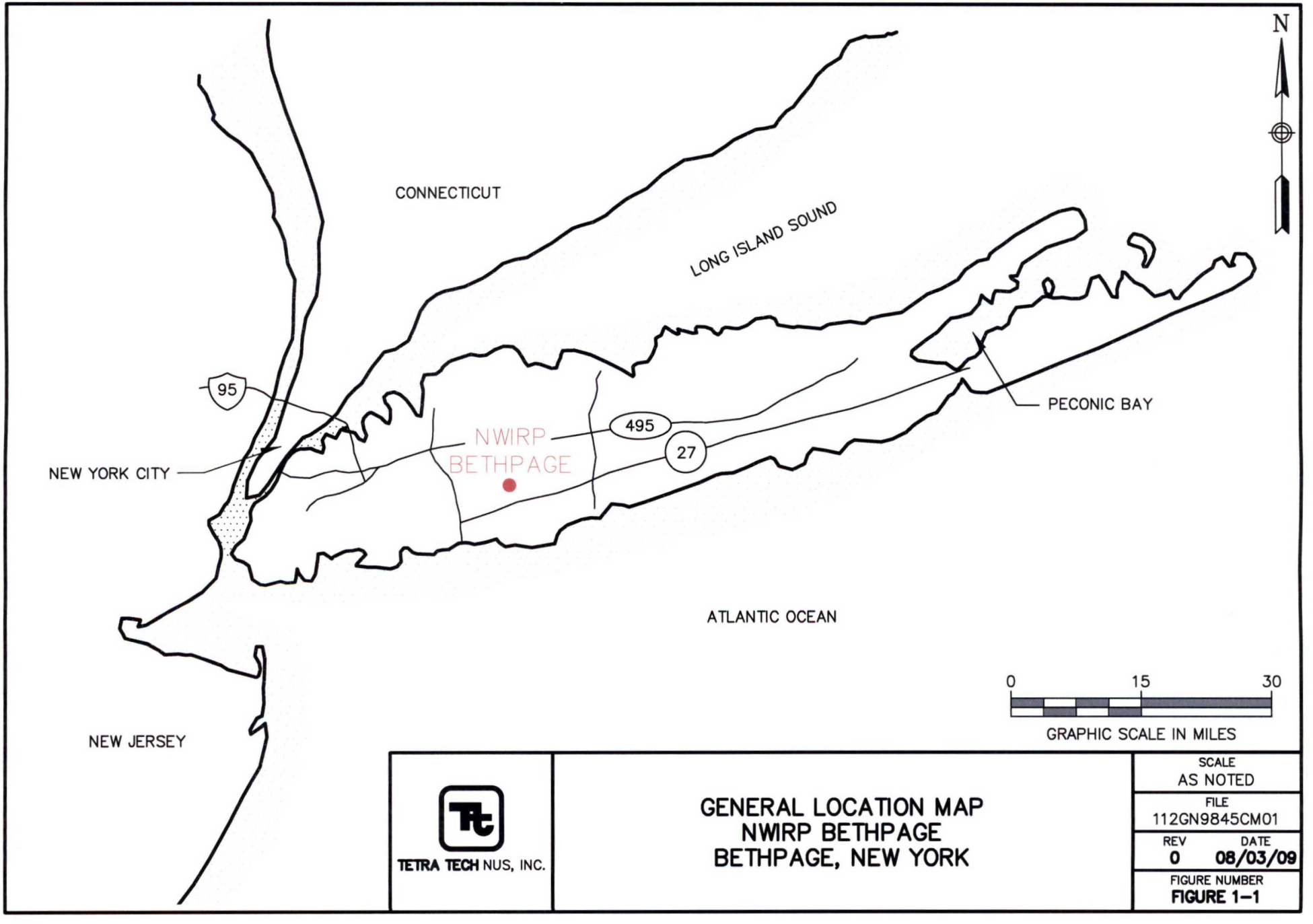
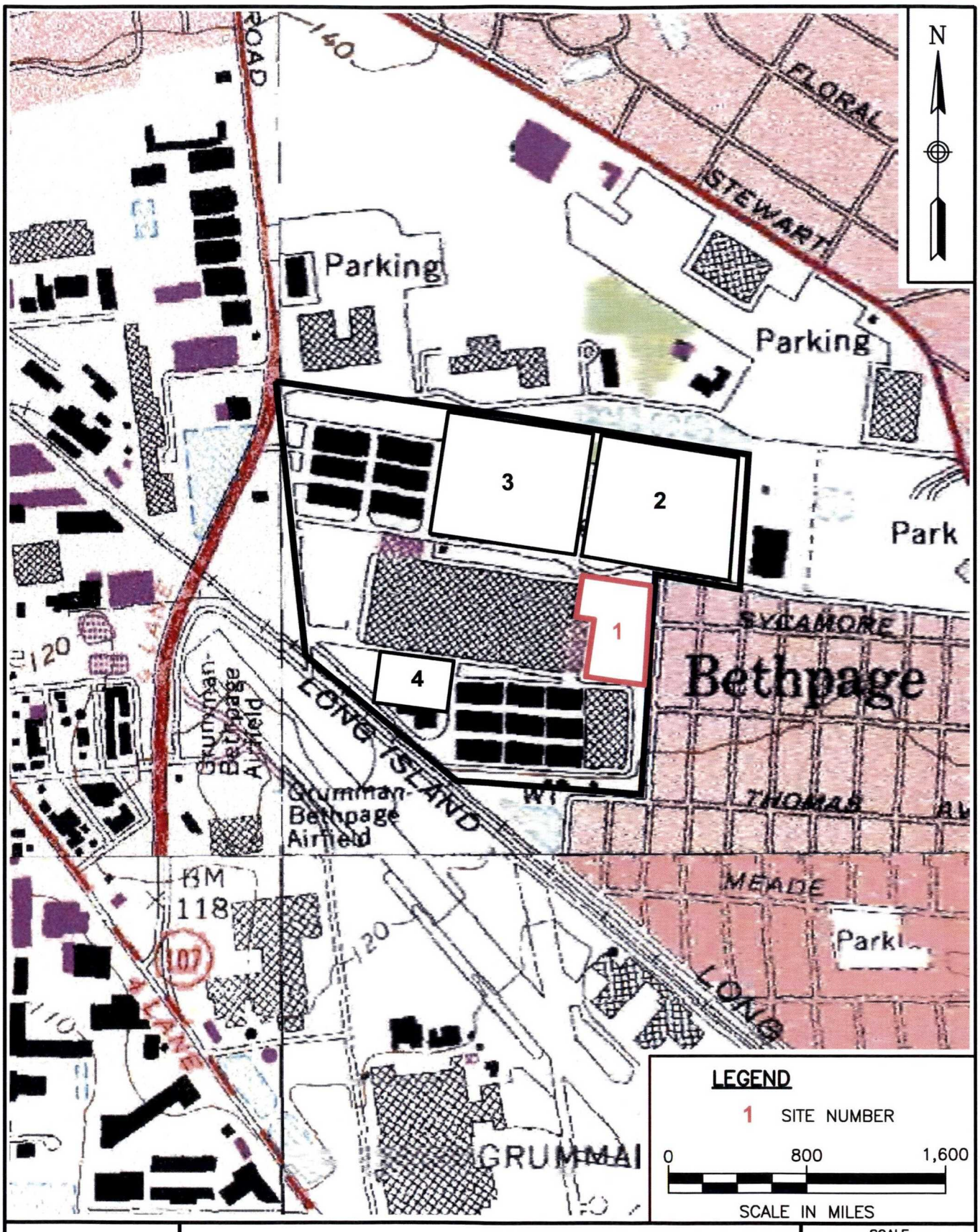


TETRA TECH NUS, INC.

GENERAL LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

SCALE	AS NOTED
FILE	112GN9845CM01
REV	0
DATE	08/03/09
FIGURE NUMBER	**FIGURE 1-1**



TETRA TECH NUS, INC.

SITE LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

SCALE	AS NOTED
FILE	112GN9845CM02
REV	0
DATE	03/04/09
FIGURE NUMBER	FIGURE 1–2

112GN9845\3310\112GN9845GM03.DWG 08/12/09 MKB

N

SITE 3
(FORMER SALVAGE STORAGE AREA)
(PROPERTY TRANSFERRED TO NASSAU COUNTY)

SITE 2
(FORMER GROUNDWATER RECHARGE BASINS)
(PROPERTY TRANSFERRED TO NASSAU COUNTY)

NAVY ACCESS EASEMENT

AOC 30
(FORMER STORAGE SHEDS)

AOC 20-08
(FORMER DRY WELL 20-08)

AOC 23
(FORMER SETTLING TANKS)

AOC 35
(FORMER SLUDGE DRYING BEDS)

SITE 1
(FORMER DRUM MARSHALLING AREA)

FORMER MANUFACTURING PLANT NO. 3

FORMER DRUM STORAGE PAD

AOC 34-07
(FORMER DRY WELL 34-07)

11TH STREET

SITE 4
AOC 22
(FORMER UNDERGROUND STORAGE TANKS)

WAREHOUSE

FORMER MANUFACTURING PLANT

WAREHOUSE

0 100 200
SCALE IN FEET

LEGEND

- FORMER DRY WELL (ABANDONED)
- PROPERTY LINE
- FENCE LINE
- SITE BOUNDARY

TETRA TECH NUS, INC.

SITE 1 LAYOUT MAP
SITE 1 EE/CA
NWIRP BETHPAGE
BETHPAGE, NEW YORK

FILE	SCALE
112GN9845GM03	AS NOTED
FIGURE NUMBER: FIGURE 1-3	REV: 0 / DATE: 08/12/09

112GN9845\3310\112GN9845GM02.DWG 08/11/09 MKB

N

SITE 1

FORMER MANUFACTURING PLANT NO. 3

FORMER MANUFACTURING PLANT

WAREHOUSE

WAREHOUSE

SYCAMORE AVENUE

MAPLE AVENUE

11TH STREET

10TH STREET

9TH STREET

BPSI-SG1005	8 ft bgs	20 ft bgs	45 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	15	59	60
TCE	1.5	16	71
TCA	3.4	11	27

BPSI-SG1004	5.5 ft bgs	20 ft bgs	45 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	22	ND	78
TCE	5.2	ND	820
TCA	3.9	ND	430

BPSI-SG1006	7 ft bgs	20 ft bgs	45 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	19	28	44
TCE	1.2	2	2.1
TCA	ND	ND	0.95

BPSI-SG2004	8 ft bgs	20 ft bgs	49 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	1.8	1,000	580
TCE	1.0	550	600
TCA	1.4	460	480

BPSI-SG2005	8 ft bgs	20 ft bgs	49 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	16.0	9.7	3.8
TCE	0.52	0.8	1.0
TCA	3.2	3.2	3.2

BPSI-SG1003	5.5 ft bgs	20 ft bgs	45 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	540 E	1,300	250
TCE	110	590	750
TCA	440 E	790	780

BPSI-SG1002	8 ft bgs	20 ft bgs	45 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	1,700	960	20
TCE	3,300	4,400	320
TCA	740	1,900	550

SVPM11	49 ft bgs
Compound	µg/m³
PCE	ND
TCE	0.29
TCA	ND

SVPM11S	24 ft bgs
Compound	µg/m³
PCE	5,300
TCE	7,200
TCA	ND

BPSI-SG2006	8 ft bgs	20 ft bgs	49 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	14	29	11
TCE	32	71	61
TCA	12	22	35

BPSI-SG1001	7 ft bgs	20 ft bgs	45 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	170	1,200	5.9
TCE	19,000	180,000	1,400
TCA	16,000	90,000	890

BPSI-SG2001	8 ft bgs	20 ft bgs	49 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	4,000	5,000	720
TCE	1,700	2,700	1,500
TCA	1,300	1,700	1,400

BPSI-SG2011	8 ft bgs	24 ft bgs	48 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	1.6	0.57 J	2.9
TCE	0.9	0.14 J	0.34
TCA	1.5	0.50 J	1.0

SVPM12	50 ft bgs
Compound	µg/m³
PCE	ND
TCE	150,000
TCA	75,000

BPSI-SG2007	8 ft bgs	20 ft bgs	49 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	13	25	5.3 J
TCE	29	87	400
TCA	150	260	870

BPSI-SG2002	8 ft bgs	20 ft bgs	44 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	420	740	48 J
TCE	34,000	89,000	26,000
TCA	21,000	52,000	27,000

SVPM12S	25 ft bgs
Compound	µg/m³
PCE	ND
TCE	73,000
TCA	36,000

BPSI-SG2009	8 ft bgs	20 ft bgs	49 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	4.8	3.2	2.0
TCE	0.2	0.23	0.4
TCA	1.1	1.6	1.1

BPSI-SG2003	8 ft bgs	20 ft bgs	49 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	19	14	8.9
TCE	20	82	710
TCA	66	170	720

BPSI-SG2008	8 ft bgs	20 ft bgs	48 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	12.0	2.1	7.4
TCE	4.7	6.8	26.0
TCA	52	80	130

BPSI-SG2010	8 ft bgs	24 ft bgs	49 ft bgs
Compound	µg/m³	µg/m³	µg/m³
PCE	3.7	4.9	2.3
TCE	2.8	19	5.5
TCA	1.4	2.2	1.0

LEGEND

- OFFSITE SOIL GAS SAMPLE LOCATION
- ONSITE SOIL GAS SAMPLE LOCATION
- SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
- *420* SOIL GAS CONCENTRATION (µg/m³)
- *J* ESTIMATED VALUE
- *E* VALUE EXCEEDED CALIBRATION RANGE
- PCE TETRACHLOROETHENE
- TCE TRICHLOROETHENE
- TCA 1,1,1-TRICHLOROETHANE
- ft bgs FEET BELOW GROUND SURFACE
- µg/m³ MICROGRAM PER CUBIC METER
- PROPERTY LINE
- FENCE LINE
- SITE BOUNDARY

	NYSDOH SUB-SLAB VALUE µg/m³	NYSDOH INDOOR AIR VALUE µg/m³
PCE	1,000	100
TCE	250	5
TCA	1,000	100

NOTE:
NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) SCREENING VALUES FROM THE NYSDOH SOIL VAPOR INTRUSION GUIDANCE.

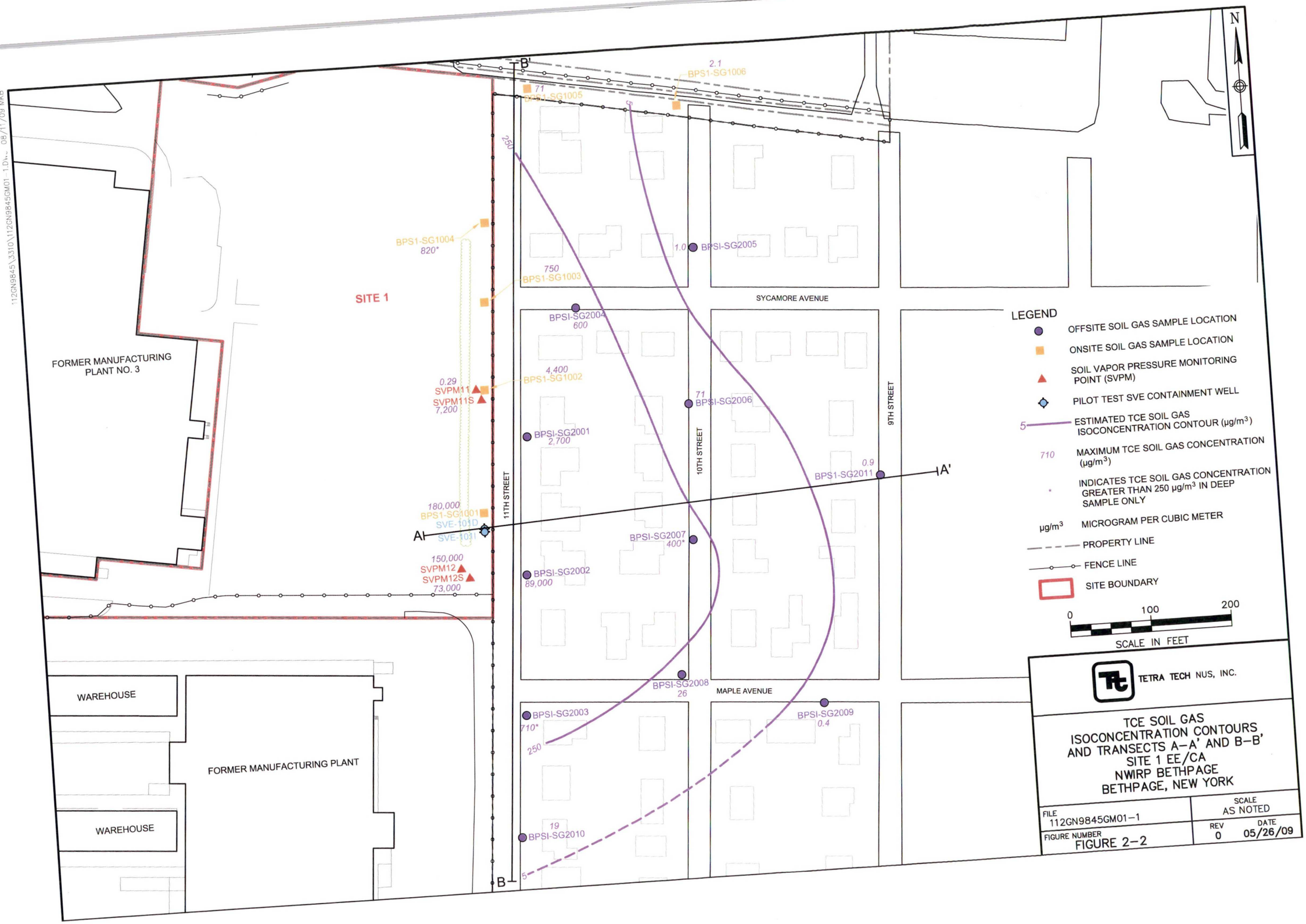
0 100 200

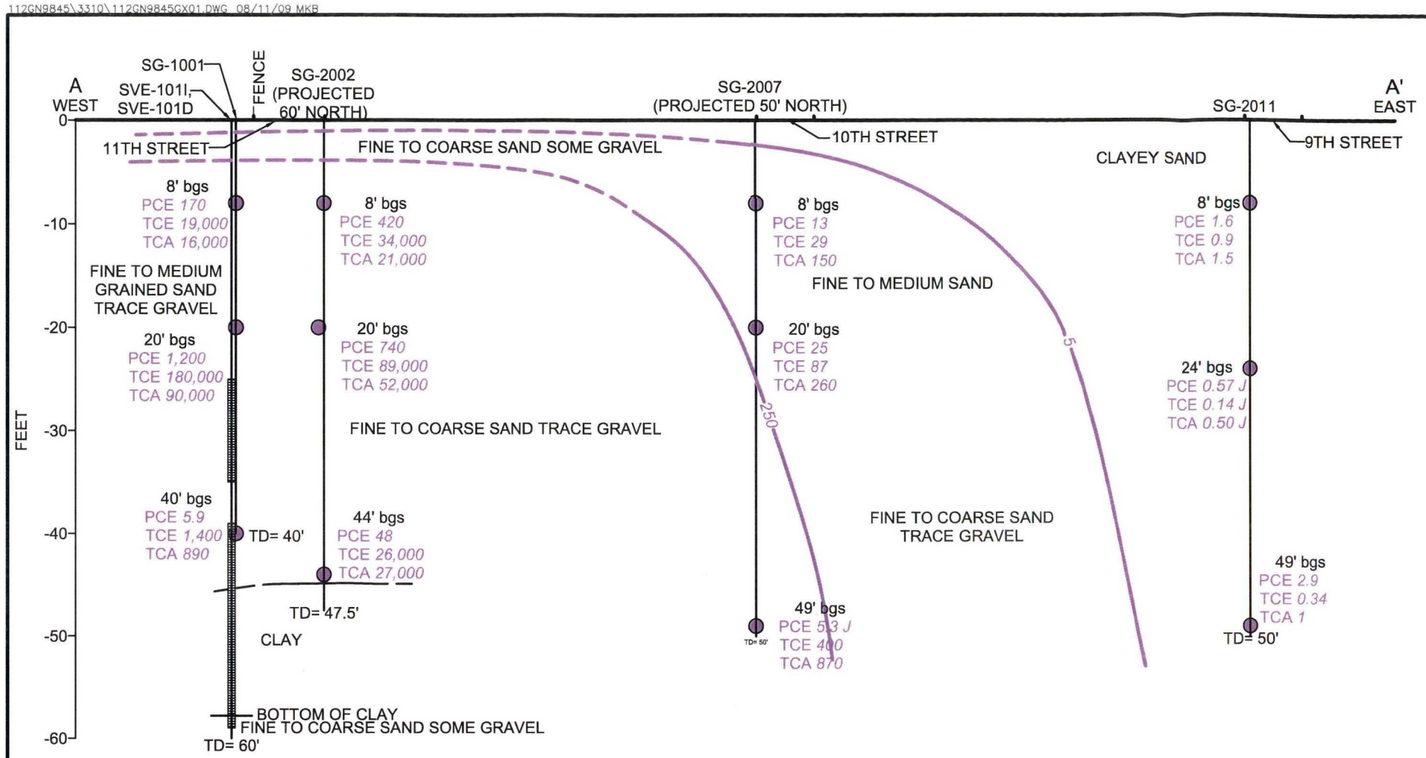
SCALE IN FEET

TETRA TECH NUS, INC.

SOIL GAS SAMPLING RESULTS JANUARY 2008 TO JANUARY 2009 SITE 1 EE/CA NWIRP BETHPAGE BETHPAGE, NEW YORK

FILE	SCALE
112GN9845GM02	AS NOTED
FIGURE NUMBER	REV / DATE
FIGURE 2-1	0 / 08/11/09


112GN9845\3310\112GN9845GM01 - 1.DI~ 08/11/09 MKB
B'
2.1
BPS1-SG1006
71
BPS1-SG1005
250
BPS1-SG1004
820*
750
BPS1-SG1003
SITE 1
1.0
BPSI-SG2005
SYCAMORE AVENUE
BPSI-SG2004
600
4,400
BPS1-SG1002
0.29
SVPM11
SVPM11S
7,200
71
BPSI-SG2006
BPSI-SG2001
2,700
10TH STREET
9TH STREET
0.9
BPS1-SG2011
A'
FORMER MANUFACTURING PLANT NO. 3
11TH STREET
180,000
BPS1-SG1001
SVE-101D
SVE-101I
A
BPSI-SG2007
400*
150,000
SVPM12
SVPM12S
73,000
BPSI-SG2002
89,000
BPSI-SG2008
26
MAPLE AVENUE
BPSI-SG2009
0.4
WAREHOUSE
FORMER MANUFACTURING PLANT
WAREHOUSE
BPSI-SG2003
710*
250
19
BPSI-SG2010
5
B
N
LEGEND
OFFSITE SOIL GAS SAMPLE LOCATION
ONSITE SOIL GAS SAMPLE LOCATION
SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
PILOT TEST SVE CONTAINMENT WELL
5 ESTIMATED TCE SOIL GAS ISOCONCENTRATION CONTOUR (µg/m3)
710 MAXIMUM TCE SOIL GAS CONCENTRATION (µg/m3)
* INDICATES TCE SOIL GAS CONCENTRATION GREATER THAN 250 µg/m3 IN DEEP SAMPLE ONLY
µg/m3 MICROGRAM PER CUBIC METER
PROPERTY LINE
FENCE LINE
SITE BOUNDARY
0
100
200
SCALE IN FEET
TETRA TECH NUS, INC.
TCE SOIL GAS
ISOCONCENTRATION CONTOURS
AND TRANSECTS A–A' AND B–B'
SITE 1 EE/CA
NWIRP BETHPAGE
BETHPAGE, NEW YORK
FILE
112GN9845GM01–1
SCALE
AS NOTED
FIGURE NUMBER
FIGURE 2–2
REV
0
DATE
05/26/09



LEGEND

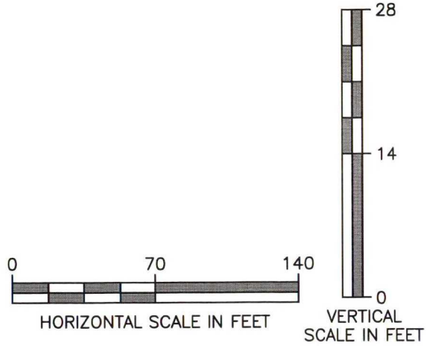
- VERTICAL SAMPLE LOCATION
- 5 — TCE ISOCONCENTRATION CONTOUR (µg/m³)
- 960 SOIL GAS CONCENTRATIONS IN MICROGRAMS PER CUBIC METER (µg/m³)
- J ESTIMATED VALUE
- E VALUE EXCEEDED CALIBRATION RANGE
- PCE TETRACHLOROETHENE
- TCE TRICHLOROETHENE
- TCA 1,1,1-TRICHLOROETHANE
- TD TOTAL DEPTH
- ' bgs FEET BELOW GROUND SURFACE

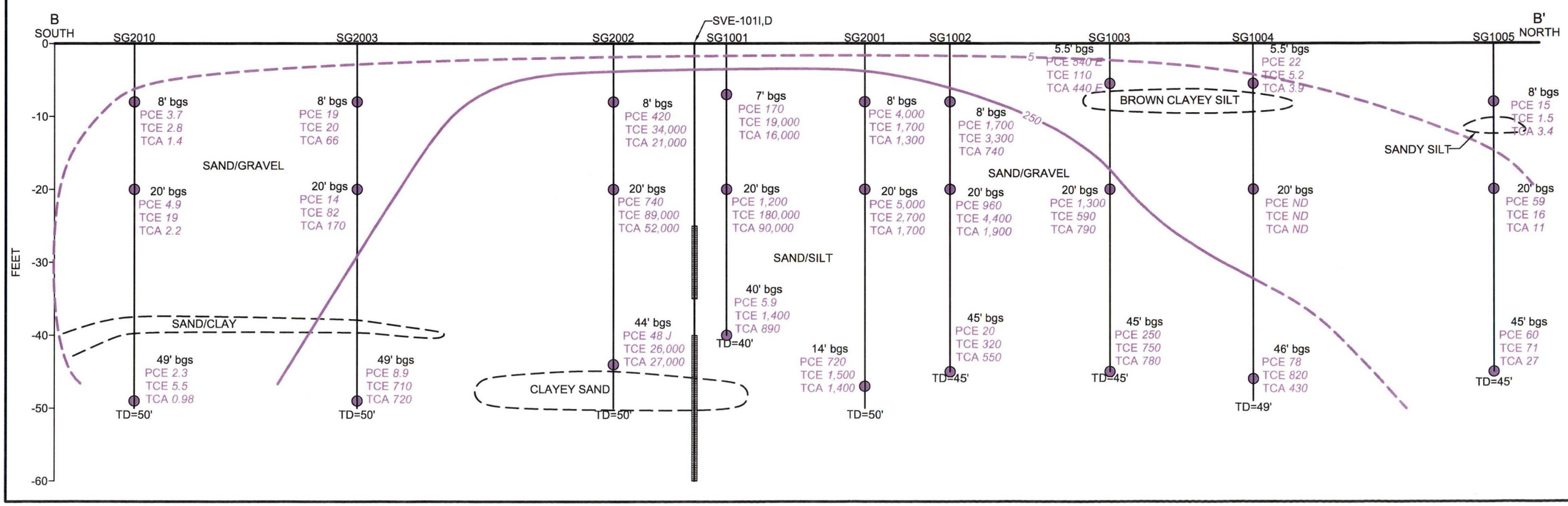
LITHOLOGY INTERPRETED FROM GEOPHYSICAL LOGS, DRILL CUTTINGS, AND/OR MACROCORE SAMPLERS.

TETRA TECH NUS, INC.

CROSS–SECTIONS A–A' AND B–B'
SITE 1 EE/CA
NWIRP BETHPAGE
BETHPAGE, NEW YORK

FILE	SCALE
112GN9845GX01	AS NOTED
FIGURE NUMBER: FIGURE 2–3	REV: 0 — DATE: 08/11/09





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N

SITE 1

SITE 4

FORMER MANUFACTURING PLANT NO. 3

SVE-106

SVE-105

SVE-104

SVE-103

SVE-101

SVE-102

11TH STREET

10TH STREET

FLOW MONITORING SYSTEM

TREATMENT BUILDING

WAREHOUSE

WAREHOUSE

WAREHOUSE

WAREHOUSE

WAREHOUSE

WAREHOUSE

FORMER MANUFACTURING PLANT

LEGEND

PROPOSED NEW SVE CONTAINMENT WELL LOCATION

SVE CONTAINMENT WELL LOCATION USED DURING THE SVE PILOT TEST

CURRENT NWIRP BOUNDARY

2-INCH PVC PIPING

10-INCH PVC PIPING

SITE BOUNDARY

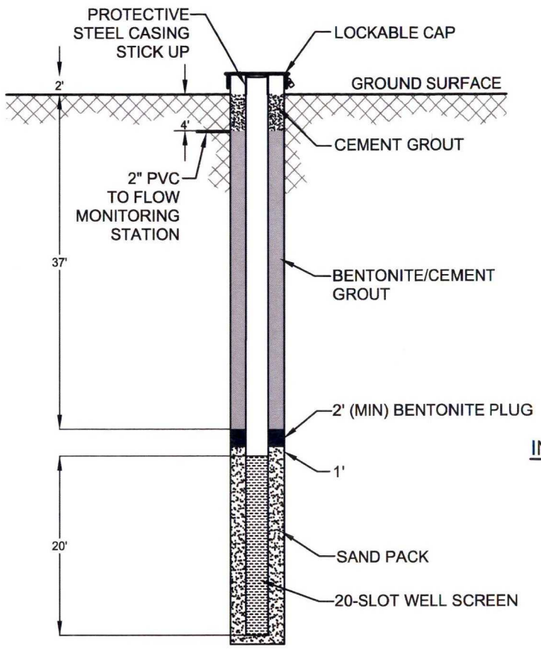
0 120 240

SCALE IN FEET

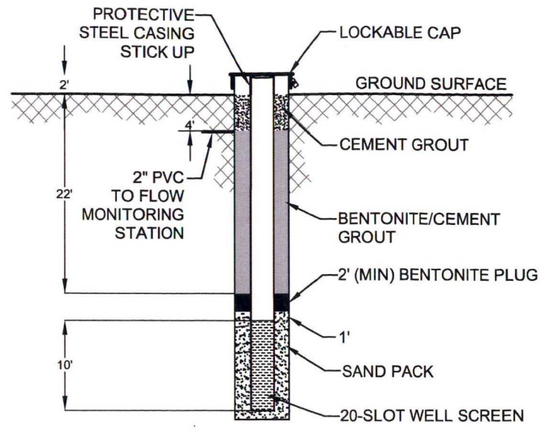
TETRA TECH NUS, INC.

ALTERNATIVE 3
SVE CONTAINMENT SYSTEM
CONCEPTUAL LAYOUT
SITE 1 EE/CA
NWIRP BETHPAGE
BETHPAGE, NEW YORK

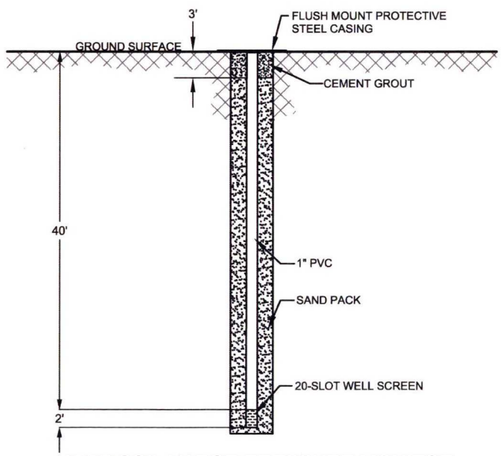
FILE	SCALE
112GN9845GM01-2	AS NOTED
FIGURE NUMBER	REV / DATE
FIGURE 4-1	0 / 08/11/09



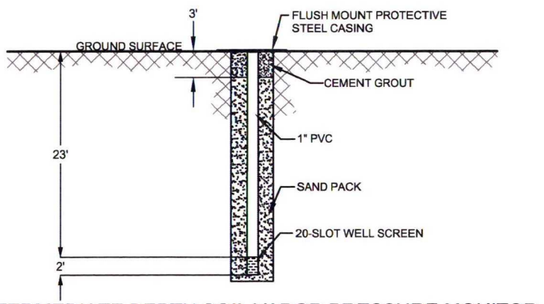
DEEP SOIL VAPOR EXTRACTION WELL DETAIL



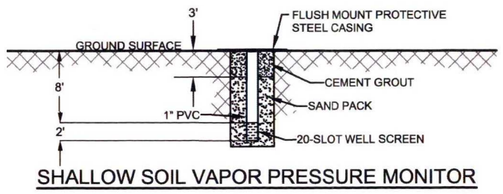
INTERMEDIATE DEPTH SOIL VAPOR EXTRACTION WELL DETAIL



DEEP SOIL VAPOR PRESSURE MONITOR



INTERMEDIATE DEPTH SOIL VAPOR PRESSURE MONITOR



SHALLOW SOIL VAPOR PRESSURE MONITOR

TETRA TECH NUS, INC.

ALTERNATIVE 3
CONSTRUCTION DETAILS FOR
PROPOSED SVE WELLS AND PRESSURE
MONITORING POINTS
SITE 1 EE/CA
NWIRP BETHPAGE
BETHPAGE, NEW YORK

FILE	SCALE
112GN9845CF01	AS NOTED
FIGURE NUMBER	REV / DATE
FIGURE 4-2	0 / 08/03/09

112GN9845\3310\112GN9845GM01-1.DWG 08/11/09 WKB

FORMER MANUFACTURING PLANT NO. 3

SITE 1

SVE-106I
SVE-106D
BPS1-SG1004
820*

SVE-105I
SVE-105D
750
BPS1-SG1003

SVE-104I
SVE-104D
0.29
SVPM11
SVPM11S
7,200
4,400
BPS1-SG1002

SVE-103I
SVE-103D
BPSI-SG2001
2,700

180,000
BPS1-SG1001
SVE-101D
SVE-101I

150,000
SVPM12
SVPM12S
73,000

SVE-102I
SVE-102D

WAREHOUSE

FORMER MANUFACTURING PLANT

WAREHOUSE

11TH STREET

250

71
BPS1-SG1005

2.1
BPS1-SG1006

1.0
BPSI-SG2005

SVPM-2004
BPSI-SG2004
600

SYCAMORE AVENUE

10TH STREET

71
BPSI-SG2006

9TH STREET

0.9
BPS1-SG2011

SVPM-2007
BPSI-SG2007
400*

SVPM-2002
BPSI-SG2002
89,000

BPSI-SG2008
26

MAPLE AVENUE

SVPM-2003
BPSI-SG2003
710*
250

BPSI-SG2009
0.4

19
BPSI-SG2010

5

N

LEGEND

- OFFSITE SOIL GAS SAMPLE LOCATION
- ONSITE SOIL GAS SAMPLE LOCATION
- SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
- PROPOSED SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
- PILOT TEST SVE CONTAINMENT WELL
- PROPOSED SVE CONTAINMENT WELL LOCATION
- ESTIMATED OFFSITE SVE CAPTURE ZONE
- 5 — ESTIMATED TCE SOIL GAS ISOCONCENTRATION CONTOUR ($\mu g/m^3$)
- 710 MAXIMUM TCE SOIL GAS CONCENTRATION ($\mu g/m^3$)
- * INDICATES TCE SOIL GAS CONCENTRATION GREATER THAN 250 $\mu g/m^3$ IN DEEP SAMPLE ONLY
- $\mu g/m^3$ MICROGRAM PER CUBIC METER
- PROPERTY LINE
- FENCE LINE
- SITE BOUNDARY

0 100 200
SCALE IN FEET

TETRA TECH NUS, INC.

ALTERNATIVE 3
CONCEPTUAL SVE CONTAINMENT SYSTEM
AND VAPOR CAPTURE ZONE
SITE 1 EE/CA
NWIRP BETHPAGE
BETHPAGE, NEW YORK

FILE	SCALE
112GN9845GM01-2	AS NOTED
FIGURE NUMBER	REV / DATE
FIGURE 4-3	0 / 08/11/09

APPENDIX A
SOIL GAS DATA

Site 1 Soil Vapor Investigation

Phase 1 Data

(Tetra Tech NUS, April 2008)

TABLE 1
SOIL GAS INVESTIGATION
FIELD ACTIVITIES
NWIRP BETHPAGE, NEW YORK

Boring Number	Drilling Method	Total Depth (feet)[1]	Depth (feet)	Soil Sample	Air Sample [2]
BPS1-SG1001	DPT	40	7	no	YES
			20	no	
			40	no	
			40 DPT	continuous	
BPS1-SG1002	DPT	45	8	no	YES
			20	no	
			45	no	
			45 DPT	continuous	
BPS1-SG1003	DPT	45	5.5	no	YES
			20	no	
			45	no	
			45 DPT	continuous	
BPS1-SG1004	DPT	46	5.5	no	YES
			22	no	
			46	no	
			46 DPT	continuous	
BPS1-SG1005	DPT	45	8	no	YES
			20	no	
			45	no	
			45 DPT	continuous	
BPS1-SG1006	DPT	45	7	no	YES
			20	no	
			45	no	
			45 DPT	continuous	
SVPM11S-24	existing	25	24	no	YES
SVPM11-49	existing	50	49	no	YES
SVPM12S-25	existing	27.1	25	no	YES
SVPM12-50	existing	52.1	50	no	YES

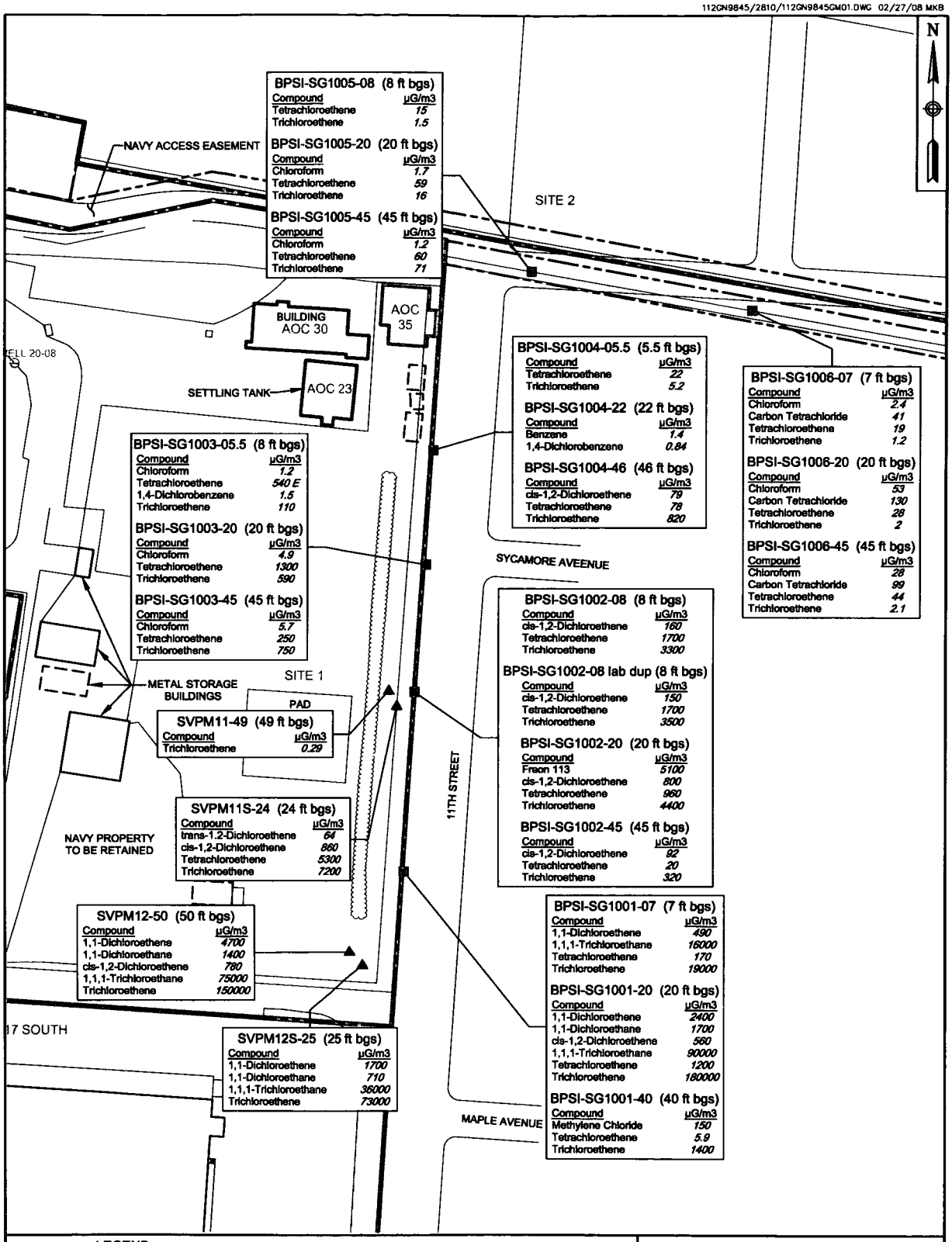
1. Depth below ground surface
2. Work area summa canister (4 to 8 hours).

DPT = Direct push technology

TABLE 2
SOIL GAS SAMPLING ANALYTICAL RESULTS
NWIRP BETHPAGE, NEW YORK
PAGE 1 OF 1

	Ambient air [1]		BPS1-SG1001-07	BPS1-SG1001-20	BPS1-SG1001-40	BPS1-SG1002-08	BPS1-SG1002-08 DUP	BPS1-SG1002-20	BPS1-SG1002-45	BPS1-SG1003-05.5	BPS1-SG1003-20	BPS1-SG1003-45	BPS1-SG1004-05.5	BPS1-SG1004-22	BPS1-SG1004-46	BPS1-SG1005-08	BPS1-SG1005-20	BPS1-SG1005-45	BPS1-SG1006-07	BPS1-SG1006-20	BPS1-SG1006-45	SVPM11S-24	SVPM11-49	SVPM12S-25	SVPM12-50
Compound	**µG/m3**		**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
Freon 12	182.50	N			4.1					0.86			1.6	1.9		1.8	1.6	1.4	1.6	1.4	1.2		1.8		
Chloromethane	94.90	N											0.83	1.1		0.79	0.34				0.5		1.1		
Freon 11	730.00	N								1.8			1.3	1.5		1.3	1.6	2.3	1.1	1.7	1.4		1.2		
Freon 113	31,390.00	N				2,200	2,900	**5,100**	2,400	790E	1,400	2,200	4		600	2.4	3	15				4,900			
1,1-Dichloroethene	219.00	C	**490**	**2,400**	15			20		0.94	5.8	8.8			4.1									**1,700**	**4,700**
Acetone	3,285.00	N	370		14	64	72	1500	2000	95	120	340	330E	230E	470	230E	490 E	740E	110	160E	570E		9.3		
Carbon Disulfide	730.00	N											3.6			2.5	4.6	2.3	3.2	4.7	2.4				
Methylene Chloride	3.79	C			**150**																				
Methyl tert-butyl ether	1.57	C										**8.2**													
trans-1,2-Dichloroethene	62.05	N				22	25	58				5.6			22							**64**			
1,1-Dichloroethane	511.00	C	130	**1,700**	14	15		62	16	1.2	19	95			460							63		**710**	**1,400**
2-Butanone	5,110.00	N	35					50	230	10	12	22	16	0.87	15	11	53	37	26	21	50		0.75		
cis-1,2-Dichloroethene	36.50	N		**560**	4.4	**160**	**200**	**800**	**92**		3.7	8.1			**79**							**860**			**780**
Chloroform	0.08	C								**1.2**	**4.9**	**5.7**					**1.7**	**1.2**	**2.4**	**53**	**28**				
1,1,1-Trichloroethane	5,219.50	N	**16,000**	**90,000**	890	740	970	1,900	550	440E	790	780	3.9		430	3.4	11	27			0.95	2,400		**36,000**	**75,000**
Carbon Tetrachloride	0.12	C																	**41**	**130**	**99**				
Benzene	0.23	C						**33**	**56**	**3.3**	**6.2**	**9.4**	**7.6**	**1.4**	**5.2**	**7.1**	**22**	**8.4**	**5.1**	**7.2**	**23**		1		
4-Methyl-2-pentanone	3,139.00	N											2.1				1.8		0.66						
Toluene	5,110.00	N						31	66	25	41	24	32	3.6	15	10	37	30	8.8	18	**40**	23	2.2		
Tetrachloroethene	0.31	C	**170**	**1,200**	**5.9**	**1,700**	**2,100**	**960**	**20**	**540E**	**1,300**	**250**	**22**		**78**	**15**	**59**	**60**	**19**	**28**	**44**	**5,300**			
Chlorobenzene	51.10	N																							
Ethyl Benzene	1,058.50	C								7.8	12	4.4	9.1			1.8	6.4	4.7	1.8	3.2	5.2				
m,p-Xylene	109.50	N							20	27	34	14	32	1.9	7.4	5.1	12	13	5	8.4	14	26	1.2		
o-Xylene										8.3	11		11	0.63		1.2	3.2	2.6	1.6	2.2	2.7				
Styrene	1,043.90	C								0.92			0.76				0.89			0.74					
1,4-Dichlorobenzene	0.16	N								**1.5**				**0.84**											
Trichloroethene	0.02	C	**19,000**	**180,000**	**1,400**	**3,300**	**4,600**	**4,400**	**320**	**110**	**590**	**750**	**5.2**		**820**	**1.5**	**16**	**71**	**1.2**	**2**	**2.1**	**7,200**	**0.29**	**73,000**	**150,000**

1 - Ambient air criteria from EPA Region 3 RBC tables, http://www.epa.gov/reg3hwmd/risk/human/index.htm
µg/m³ = micrograms per cubic meter of air
C = Carcinogenic effects N = Noncarcinogenic effects
Bolded values are exceedances of EPA Region 3 RBCs.
E = exceeds instrument calibration range, reported results likely exceed plus/minus 25 %.
Blank cells indicate a non-detect value.



LEGEND

- DRY WELL
- SOIL GAS SAMPLE LOCATION
- SOIL VAPR PRESSURE MONITOR
- PROPERTY LINE
- FENCE LINE
- SITE BOUNDARY
- AOC BOUNDARY

NOTE:
FIGURE PRESENTS VOLATILE ORGANIC COMPOUNDS THAT EXCEED EPA REGION 3 RBCs FOR INDOOR AIR. FOR COMPARISON, NEW YORK STATE DEPARTMENT OF HEALTH INDOOR AIR CRITERIA FOR TCE AND PCE ARE 5 µg/m³ AND 100 µg/m³ RESPECTIVELY.

0 80 160
SCALE IN FEET

TETRA TECH NUS, INC.

SOIL GAS RESULTS
SITE 1
NWIRP BETHPAGE
BETHPAGE, NEW YORK

FILE	SCALE
112GN9845GM01	AS NOTED
FIGURE NUMBER: FIGURE 4	REV: 0 DATE: 02/27/08

Site 1 Soil Vapor Investigation

Phase 2 Data

(Tetra Tech NUS, June 2009)

TABLE 1
FIELD INVESTIGATION SUMMARY
SOIL GAS BORINGS
PHASE II SOIL GAS TESTING
NWIRP BETHPAGE, NEW YORK

Boring Number	Drilling Method	Total Boring Depth (feet)[1]	Sample Depth (feet)	Continuous Soil Core	Air Sample ID [2]
BPS1-SG2001	DPT	50	8	NO	BPS1-SG2001-08
			20	NO	BPS1-SG2001-20
			49	YES	BPS1-SG2001-49
BPS1-SG2002	DPT	47.5	8	NO	BPS1-SG2002-08
			20	NO	BPS1-SG2002-20
			44	YES	BPS1-SG2002-44
BPS1-SG2003	DPT	50	8	NO	BPS1-SG2003-08
			8	NO	BPS1-SG2003-08-DUP
			20	NO	BPS1-SG2003-20
			49	YES	BPS1-SG2003-49
BPS1-SG2004	DPT	50	8	NO	BPS1-SG2004-08
			20	NO	BPS1-SG2004-20
			49	YES	BPS1-SG2004-49
			49	YES	BPS1-SG2004-49-DUP
BPS1-SG2005	DPT	40	8	NO	BPS1-SG2005-08
			20	NO	BPS1-SG2005-20
			49	YES	BPS1-SG2005-49
BPS1-SG2006	DPT	50	8	NO	BPS1-SG2006-08
			20	NO	BPS1-SG2006-20
			49	YES	BPS1-SG2006-49
BPS1-SG2007	DPT	50	8	NO	BPS1-SG2007-08
			20	NO	BPS1-SG2007-20
			20	NO	BPS1-SG2007-20-DUP
			49	YES	BPS1-SG2007-49
BPS1-SG2008	DPT	50	8	NO	BPS1-SG2008-08
			20	NO	BPS1-SG2008-20
			49	YES	BPS1-SG2008-49
BPS1-SG2009	DPT	55	8	NO	BPS1-SG2009-08
			25	NO	BPS1-SG2009-25
			48	YES	BPS1-SG2009-48
BPS1-SG2010	DPT	50	8	NO	BPS1-SG2010-08
			24	NO	BPS1-SG2010-24
			49	YES	BPS1-SG2010-49
BPS1-SG2011	DPT	49	8	NO	BPS1-SG2011-08
			24	NO	BPS1-SG2011-24
			48	YES	BPS1-SG2011-48

1 - Depth below ground surface

2 - Summa canister collection (sample time of 35-120 minutes).

DPT - Direct push technology

DUP - Duplicate

TABLE 2
ANALYTICAL SUMMARY OF DETECTIONS
AMBIENT AIR SAMPLING - OCTOBER 2008 THROUGH JANUARY 2009
NWIRP BETHPAGE, NEW YORK

	BPS1-FB2001-00	BPS1-FB2002-00	BPS1-FB2003-00	BPS1-FB2004-00	BPS1-FB2005-00	BPS1-FB2006-00	BPS1-FB2007-01
Date	10/21/2008	10/23/2008	10/24/2008	10/28/2008	10/30/2008	10/31/2008	1/6/2009
Compound	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**	**µg/m^3**
Trichloroethene	0.062 J	0.019 J	0.083 J	0.081 J	0.052 J	0.22	0.38
Tetrachloroethene	0.77 J		0.51 J	0.60 J		1.1 J	
1,2,4-Trichlorobenzene				0.76 J			
1,4-Dichlorobenzene				0.31 J		0.90 J	
2-Butanone (Methyl Ethyl Ketone)	2	0.47	2.2	2	1.5	1.4	1
4-Methyl-2-pentanone	0.13 J		0.17 J			0.45 J	
Acetone	12	5.9	56 J	7.6	8.4	9.1	1.9 J
Benzene	0.82	0.33 J	0.94	0.96	0.46 J	2.5	0.91
Bromomethane	0.63	0.73	1.7				
Carbon Disulfide				1.8 J	0.36 J		
Carbon Tetrachloride	0.65 J	0.53 J	0.48 J	0.63 J	0.49 J	0.53 J	0.40 J
Chloromethane	0.69	0.56	0.66	1.2	1.2	1.1	1.2
Ethyl Benzene	0.35 J		0.39 J	0.47 J		1.2	
Freon 11	1.4	1.2	1.2	1.6	1.7	1.6	1.2 J
Freon 113	0.64 J	0.47 J	0.75 J	0.73 J	0.66 J	0.74 J	0.66 J
Freon 12	2.6	2.4	2.2	2.6	3	2.6	2.5
m,p-Xylene	0.74	0.21	1.1	1.1	0.37 J	3.4	0.48 J
Methylene Chloride	0.66 J		0.20 J	0.63 J	0.41 J	1.2 J	
o-Xylene	0.24 J		0.41 J	0.40 J		1.3	0.18 J
Styrene	0.085 J		0.089 J			0.27 J	
Toluene	27	0.63	2.5	6.6	1.1	6.9	1.4

µg/m^3 = micrograms per cubic meter of air
J = estimeated value
Blank cells indicate a non-detect value.

TABLE 3
ANALYTICAL SUMMARY OF DETECTIONS
SOIL GAS SAMPLING - JANUARY 2008 THROUGH JANUARY 2009
NWIRP BETHPAGE, NEW YORK

	EPA Regional Screening Levels Residential Air[1]	NYSDOH Air Guideline Values[2]	Proposed WP Levels	BPS1-SG1001-07	BPS1-SG1001-20	BPS1-SG1001-40	BPS1-SG1002-08	BPS1-SG1002-08 DUP	BPS1-SG1002-20	BPS1-SG1002-45	BPS1-SG1003-05.5	BPS1-SG1003-20	BPS1-SG1003-45	BPS1-SG1004-05.5	BPS1-SG1004-22	BPS1-SG1004-46	BPS1-SG1005-08	BPS1-SG1005-20	BPS1-SG1005-45	BPS1-SG1006-07	BPS1-SG1006-20	BPS1-SG1006-45	SVPM11S-24	SVPM11-49	SVPM12S-25	SVPM12-50
Date				Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008	Jan. 2008
Compound	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
Trichloroethene	1.20	5/250	5	**19,000**	**160,000**	**1,400**	**3300 J**	**4,800**	**4,400**	**320**	**110**	**590**	**750**	**5.2**		**820**	1.5	**16**	**71**	1.2	2.0	2.1	**7,200**	0.29	**73,000**	**150,000**
Tetrachloroethene	0.41	100/1000	100	**170**	**1,200**	5.9	**1,700**	**2,100**	**960**	20	**540J**	**1,300**	**250**	22		78	15	59	60	19	28	44	**5,300**			
1,1,1-Trichloroethane	5200.00	NA/1000	5200.00	**16,000**	**90,000**	890	740	970	**1,900**	550	440J	790	780	3.9		430	3.4	11	27			0.95	**2,400**		**36,000**	**75,000**
1,1-Dichloroethane	1.50		5 - 150	**130**	**1,700**	**14**	**15**		**62**	**16**	1.2	**19**	**95**			**460**							**63**		**710**	**1,400**
1,1-Dichloroethene	210.00		210.00	**490**	**2,400**	15			20	6.6J	0.94	5.8	8.8			4.1									**1,700**	**4,700**
Benzene	0.31		5 - 31			1.1J	**5.1J**		**33**	**56**	3.3	**6.2**	**9.4**	**7.6**	1.4	**5.2**	**7.1**	**22**	**8.4**	**5.1**	**7.2**	**23**		1		
Chloroform	0.11		5 - 11			0.52 J	**5.6J**		**7.3J**		1.2	4.9	**5.7**			2.6J		1.7	1.2	2.4	**53**	**28**				
cis-1,2-Dichloroethene	NA		36.50	24 J	**560J**		**160**	**200**	**800**	**92J**		3.7	8.1			**79**							**860**		**200J**	**780**
Carbon Tetrachloride	0.16	5/250												0.67	0.47J		0.30J		0.28J	41	130	99		0.75J		
Methylene Chloride	5.20	60/NA				150																				
1,2,4-Trichlorobenzene	NA																									
1,2-Dichlorobenzene	210.00																									
1,2-Dichloroethane	0.09																									
1,2-Dichloropropane	0.24																									
1,3-Dichlorobenzene	NA																									
1,4-Dichlorobenzene	0.22																									
2-Butanone	NA			35					50	230	10	12	22	16	0.87	15	11J	53J	37	26J	21J	50		0.75		
4-Methyl-2-pentanone	NA													2.1	0.11J			1.8		0.66						
Acetone	32000.00			370		14	64	72	1500	2000	95	120	340	330J	230J	470	230J	490 J	740J	110	160J	570J	49J	9.3	320J	500J
Bromomethane	5.20																0.27J									
Carbon Disulfide	730.00						3.5J		3.9J	6.0J	1.1J	2.8J	1.3J	3.6	0.15J	1.6J	2.5	4.6	2.3	3.2	4.7	2.4				
Chlorobenzene	52.00													0.061J												
Chloroethane	NA																									
Chloromethane	1.40									5.2J				0.83	1.1		0.79	0.34	0.18J	0.25J		0.5		1.1		
Ethyl Benzene	0.97								5.9J	8.4J	7.8	12	4.4	9.1	0.53J	2.7J	1.8	6.4	4.7	1.8	3.2	5.2		0.49J		
Freon 11	NA					2.3J	4.4J				1.8	1.4J	2.0J	1.3	1.5	1.7J	1.3	1.6	2.3	1.1	1.7	1.4		1.2		
Freon 113	NA			19 J		2.1J	2200J	2900J	5100J	2400J	790J	1400J	2200J	4J	0.69J	600J	2.4	3	15	0.73J	0.64J	0.70J	4900J	0.79J		
Freon 12	NA					4.1					0.86		2.8J	1.6	1.9		1.8	1.6	1.4	1.6	1.4	1.2		1.8		
m,p-Xylene	730.00								9.1J	20	27	34	14	32	1.9	7.4	5.1	12	13	5	8.4	14	26	1.2		
Methyl tert-butyl ether	9.40												8.2													
o-Xylene	730.00									7.6J	8.3	11	2.4J	11	0.63	1.6J	1.2	3.2	2.6	1.6	2.2	2.7	12J	0.47J		
Styrene	1000.00										0.92	1.0J		0.76	0.084J		0.26J	0.89	0.46J		0.74	0.54J		0.085J		
Toluene	5300.00			13 J		2.1J			31	66	25	41	24	32	3.6	15	10	37	30	8.8	18	40	23	2.2		
trans-1,2-Dichloroethene	63.00						22	25	58	92J	0.22J	3.0J	5.6			22							64			

[1]Residential air criteria from Regional Screening Tables (September 2008), http://www.epa.gov/reg3hwmd/risk/human/rb-
[2] Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006), Air Guideline Values read as Indoor air/sub-slab
µg/m³ = micrograms per cubic meter of air
NA : Not Available
Bolded values are exceedances of Proposed Work Plan (WP) Levels (TTNUS, 2008)
Shaded values are exceedances of NYSDOH Air guideline values for Indoor air/Sub-Slab concentrations
J = estimated value
Blank cells indicate a non-detect value.
Note: Initial onsite sampling took place January 2008 and initial offsite sampling took place October 2008 through January 2009

TABLE 3
ANALYTICAL SUMMARY OF DETECTIONS
SOIL GAS SAMPLING - JANUARY 2008 THROUGH JANUARY 2009
NWIRP BETHPAGE, NEW YORK

	EPA Regional Screening Levels Residential Air[1]	NYSDOH Air Guideline Values[2]	Proposed WP Levels	BPS1-SG2001-08	BPS1-SG2001-20	BPS1-SG2001-49	BPS1-SG2002-08	BPS1-SG2002-20	BPS1-SG2002-44	BPS1-SG2003-08	BPS1-SG2003-20	BPS1-SG2003-49	BPS1-SG2004-08	BPS1-SG2004-20	BPS1-SG2004-49	BPS1-SG2005-08	BPS1-SG2005-20	BPS1-SG2005-49	BPS1-SG2006-08	BPS1-SG2006-20	BPS1-SG2006-49
Date				Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008
Compound	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**	**µg/m³**
Trichloroethene	1.20	5/250	5	**1,700**	**2,700**	**1,500**	**34,000**	**89,000**	**26,000**	**20**	**82**	**710**	1.0	**550**	**600**	0.52	0.8	1.0	**32**	**71**	**61**
Tetrachloroethene	0.41	100/1000	100	**4,000**	**5,000**	**720**	**420**	**740**	48 J	19	14	8.9	1.8	**1,000**	**580**	16	9.7	3.8	14	29	11
1,1,1-Trichloroethane	5200.00	NA/1000	5200.00	**1,300**	**1,700**	1,400	**21,000**	**52,000**	**27,000**	66	170J	720J	1.4	460	480	3.2	3.2	3.2	12	22	35
1,1-Dichloroethane	1.50		5 - 150	**11**	**29**	**26**	**170**	**680**	**490**		0.49 J	**8.6**		**44**	**74**						
1,1-Dichloroethene	210.00		210.00	9.2 J	16	27	**220**	**890**	**480**		2	23		7.1						0.62	1.2
Benzene	0.31		5 - 31	**7.8 J**	4.7 J	**9.1**	**28 J**		**11 J**	3.5	**6.4**	**8.5**	1.1	3.5	**15.0**	4.5	3.9	**5.8**	2.5	**7**	**5.4**
Chloroform	0.11		5 - 11	**110**	**24**	**8.2**	**41 J**	**32 J**	**19 J**	4.6	3	**9.4**	0.25 J	**25**	**24.0**	**5.0**	**8.7**	**16**	3.0	3.7	**6.1**
cis-1,2-Dichloroethene	NA		36.50	20	**94**	**73**	**49 J**	**170**	**130**			1.6		4.6					4.1	**45**	**89**
Carbon Tetrachloride	0.16	5/250				0.13 J							0.55J			**110**	**140**	**130**	0.94J	2.10	2.50
Methylene Chloride	5.20	60/NA																			
1,2,4-Trichlorobenzene	NA																				
1,2-Dichlorobenzene	210.00																				
1,2-Dichloroethane	0.09												0.25J								
1,2-Dichloropropane	0.24												0.59J								
1,3-Dichlorobenzene	NA									0.25J	0.26J										
1,4-Dichlorobenzene	0.22									0.33J	0.31J		0.36J			0.32J	0.27J	0.28J			0.35J
2-Butanone	NA			50	56	65	78		78	19	31	47	4	30	100	60	60	44	68	59	140
4-Methyl-2-pentanone	NA			2.3J						2			0.47J		1.2J	1.10	0.60	0.93	0.47J	1.10	0.80
Acetone	32000.00			470	440	500	300	250	1,200	120	170J	410J	29	240	640	630J	790J	700J	1200J	860J	1100J
Bromomethane	5.20															0.81		1.10	2.30	0.73	
Carbon Disulfide	730.00			3.0J	3.3J					2	3.0	2.5J	1.1	2.2J	3.4J	6.6J	2.7J	1.9J	2.1J	1.5J	2.2
Chlorobenzene	52.00																	0.12J		0.15J	
Chloroethane	NA																	0.25J		0.15J	
Chloromethane	1.40									0.23J	0.13J	0.46J	1			0.22J		0.53		0.27J	0.25J
Ethyl Benzene	0.97			4.7J	4.4J	7.9	170		12J	6	8	7.8	1.0	3.6	7.3	3.1	4.1	4.0	8.8	6.2	6.5
Freon 11	NA			6.5J	6.1J	6.5J				13.0	13.0	40.0	1.5	4.7	3.4J	7.7J	4.7J	2.5J	2.3J	2.3J	2.8J
Freon 113	NA			2,200	2,800	2,500			34J	1	2	4	.79J	1,200	1,300	10J	10J	14J	170J	280J	300J
Freon 12	NA			2.9J	2.8J	2.6J				1.3	1.2	3.9	2.5	3.6	2.9J	1.4	1.3	1.1	2.3	1.2	1.5
m,p-Xylene	730.00			12	14	26	290.0	32J	40J	20.0	25.0	25.0	3.1	12.0	21.0	9.6	13.0	13.0	33.0	20.0	19.0
Methyl tert-butyl ether	9.40													1.7J	11						
o-Xylene	730.00			3.5J	3.4J	9.2	80J		16J	8.4	9.8	10.0	1.2	3.3	5.8	2.2	3.4	2.8	12.0	7.2	5.3
Styrene	1000.00			2.0J	1.8J	17				21.0	26.0	24.0	1.4	2.0J		1.8	1.6	1.90	37.00	21.00	2.10
Toluene	5300.00			33	32	65	500	46J	65J	20	35	63	6.7	24	52	26	38.0	55.0	35	34	60
trans-1,2-Dichloroethene	63.00			7.9J	16.0	11								3.9						1.4J	2.7

[1]Residential air criteria from Regional Screening Tables (September 2008), http://www.epa.gov/reg3hwmd/risk/human/rb-

[2] Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006), Air Guideline Values read as Indoor air/sub-slab

µg/m³ = micrograms per cubic meter of air

NA : Not Available

Bolded values are exceedances of Proposed Work Plan (WP) Levels (TTNUS, 2008)

Shaded values are exceedances of NYSDOH Air guideline values for Indoor air/Sub-Slab concentrations

J = estimated value

Blank cells indicate a non-detect value.

Note: Initial onsite sampling took place January 2008 and initial offsite sampling took place October 2008 through January 2009

TABLE 3
ANALYTICAL SUMMARY OF DETECTIONS
SOIL GAS SAMPLING - JANUARY 2008 THROUGH JANUARY 2009
NWIRP BETHPAGE, NEW YORK

	EPA Regional Screening Levels Residential Air[1]	NYSDOH Air Guideline Values[2]	Proposed WP Levels	BPS1-SG2007-08	BPS1-SG2007-20	BPS1-SG2007-49	BPS1-SG2008-08	BPS1-SG2008-20	BPS1-SG2008-49	BPS1-SG2009-08	BPS1-SG2009-25	BPS1-SG2009-48	BPS1-SG2010-08	BPS1-SG2010-24	BPS1-SG2010-49	BPS1-SG2011-08	BPS1-SG2011-24	BPS1-SG2011-48
Date				Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Oct. 2008	Jan. 2009	Jan. 2009	Jan. 2009	Jan. 2009	Jan. 2009	Jan. 2009
Compound	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
Trichloroethene	1.20	5/250	5	**29**	**87**	**490**	4.7	**6.5**	**26.0**	0.2	0.23	0.4	2.8	**19.0**	**5.5**	0.9	0.14 J	0.34
Tetrachloroethene	0.41	100/1000	100	13	25	5.3 J	12	2.1	7.4	4.8	3.2	2.0	3.7	4.9	2.3	1.6	0.57 J	2.9
1,1,1-Trichloroethane	5200.00	NA/1000	5200.00	150	260	870	52	80	130	1.1	1.6	1.1	1.4	2.2	1.0	1.5	0.50 J	1.0
1,1-Dichloroethane	1.50		5 - 150			3.0 J												
1,1-Dichloroethene	210.00		210.00	0.26 J	0.69 J	13			1									
Benzene	0.31		5 - 31	**5.7**	**5.8**	**11**	**5.4**	**13**	**9.3**	2.9	3.4	**19.0**	3.5	3.7	**7.8**	2.8	3.3	**19.0**
Chloroform	0.11		5 - 11	1	0.72 J	4.1 J	1.2	3.4	**9.1**	0.92	**5.8**	**6.1**	**16.0**	2.2	0.9	0.29 J	0.46 J	2.7
cis-1,2-Dichloroethene	NA		36.50															
Carbon Tetrachloride	0.16	5/250		0.33J			0.40J	0.52J	0.85					0.32 J	0.56 J		0.45 J	
Methylene Chloride	5.20	60/NA		0.66J									0.58 J				0.56 J	
1,2,4-Trichlorobenzene	NA				0.37J													
1,2-Dichlorobenzene	210.00			0.19J														
1,2-Dichloroethane	0.09												6.9					0.73
1,2-Dichloropropane	0.24												8.3					
1,3-Dichlorobenzene	NA																	0.17 J
1,4-Dichlorobenzene	0.22			0.26J								0.23J		0.38 J				
2-Butanone	NA			58	41	200	44	160	100	20	25	26	25	66	110	50	72	290 E
4-Methyl-2-pentanone	NA			0.62	0.67J	2.0J	1.60	1.60	4.10	1.00	0.82					5.9	3.3	
Acetone	32000.00			850J	630J	3400J	460J	1200J	860J	230J	400J	230J	44	55	130	34	56	240 J
Bromomethane	5.20			0.93	0.78J		0.43J	1.60	1.20	0.51J	0.68	1.10	0.21 J	0.20 J				0.40 J
Carbon Disulfide	730.00			2.7J	2.5J	4.9J	2.8J	3.7J	1.2J	2.1J	2.2J	0.90J	0.96 J	2.10	0.95 J	2.30	1.1 J	2.50
Chlorobenzene	52.00								0.17J									
Chloroethane	NA											0.39						
Chloromethane	1.40			0.11J			0.14J	0.24J	0.46	0.29	0.32	0.83	0.26 J	0.27	1.00	0.26 J	1.00	0.91
Ethyl Benzene	0.97			1.5	2.9	7.3	3.5	2.8	4.4	3.2	4.2	5.6	4.8	5.8	2.5	4.0	2.6	5.0
Freon 11	NA			2.5J	2.7	2.6J	3.9J	4.1J	3.3J	16J	12J	7.3J	14	28	11	5.1	3.6	5.5
Freon 113	NA			11J	16J	41.0	0.94J	1.4J	1.3J	0.65J	0.57J	0.46J	0.69 J	0.81 J	0.66 J	0.39 J	0.81 J	0.72 J
Freon 12	NA			1.1	2.8		1.2	2.1	2.2	3.7	5.6	5.8	1.8	1.4	2.0	1.6	2.2	2.3
m,p-Xylene	730.00			3.6	10.0	27.0	12.0	7.2	13.0	11.0		17.0	13.0	14.0	7.1	11	5.8	15.0
Methyl tert-butyl ether	9.40																	
o-Xylene	730.00			0.60J	2.3	8.4	2.7	1.7	2.8	3.0		4.1	6.1	5.2	2.6	49.0	2.2	5.9
Styrene	1000.00			0.12J	0.84J	2.10	0.91	0.53J	0.95	0.66		0.91	9.60	8.40	2.80	8.20	2.70	0.57
Toluene	5300.00			20	20	65	27	49	57.0	24.0	38	71.0	170.0	170	48.0	100	97.0	52.0
trans-1,2-Dichloroethene	63.00																	

[1]Residential air criteria from Regional Screening Tables (September 2008), http://www.epa.gov/reg3hwmd/risk/human/rb-

[2] Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006), Air Guideline Values read as Indoor air/sub-slab

µg/m³ = micrograms per cubic meter of air

NA : Not Available

Bolded values are exceedances of Proposed Work Plan (WP) Levels (TTNUS, 2008)

Shaded values are exceedances of NYSDOH Air guideline values for Indoor air/Sub-Slab concentrations

J = estimated value

Blank cells indicate a non-detect value.

Note: Initial onsite sampling took place January 2008 and initial offsite sampling took place October 2008 through January 2009


112G01687/0510/112G01687GM02.DWG 04/24/09 MKB
AOC 30
AOC 35
AOC 23
SETTLING TANK
SITE 1
PLANT NO. 3
METAL STORAGE BUILDINGS
PAD
PLANT 17 SOUTH
SYCAMORE AVENUE
MAPLE AVENUE
11TH STREET
10TH STREET
9TH STREET
BPSI-SG1005 8 ft bgs 20 ft bgs 45 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 15 59 60
TCE 1.5 16 71
TCA 3.4 11 27
BPSI-SG1004 5.5 ft bgs 20 ft bgs 45 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 22 ND 78
TCE 5.2 ND 820
TCA 3.9 ND 430
BPSI-SG2004 8 ft bgs 20 ft bgs 49 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 1.8 1,000 580
TCE 1.0 550 600
TCA 1.4 460 480
BPSI-SG1006 7 ft bgs 20 ft bgs 45 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 19 28 44
TCE 1.2 2 2.1
TCA ND ND 0.95
BPSI-SG2005 8 ft bgs 20 ft bgs 49 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 16.0 9.7 3.8
TCE 0.52 0.8 1.0
TCA 3.2 3.2 3.2
BPSI-SG1003 5.5 ft bgs 20 ft bgs 45 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 540 E 1,300 250
TCE 110 590 750
TCA 440 E 790 780
BPSI-SG1002 8 ft bgs 20 ft bgs 45 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 1,700 960 20
TCE 3,300 4,400 320
TCA 740 1,900 550
SVPM11 49 ft bgs
Compound ug/m3
PCE ND
TCE 0.29
TCA ND
SVPM11B 24 ft bgs
Compound ug/m3
PCE 5,300
TCE 7,200
TCA ND
BPSI-SG2006 8 ft bgs 20 ft bgs 49 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 14 29 11
TCE 32 71 61
TCA 12 22 35
BPSI-SG1001 7 ft bgs 20 ft bgs 45 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 170 1,200 5.9
TCE 19,000 180,000 1,400
TCA 16,000 90,000 890
BPSI-SG2001 8 ft bgs 20 ft bgs 49 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 4,000 5,000 720
TCE 1,700 2,700 1,500
TCA 1,300 1,700 1,400
BPSI-SG2011 8 ft bgs 24 ft bgs 48 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 1.6 0.57 2.9
TCE 0.9 0.14 0.34
TCA 1.5 0.50 1.0
SVPM12 50 ft bgs
Compound ug/m3
PCE ND
TCE 150,000
TCA 75,000
BPSI-SG2007 8 ft bgs 20 ft bgs 49 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 13 25 5.3 J
TCE 29 87 400
TCA 150 260 870
BPSI-SG2002 8 ft bgs 20 ft bgs 44 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 420 740 48 J
TCE 34,000 89,000 26,000
TCA 21,000 52,000 27,000
SVPM12S 25 ft bgs
Compound ug/m3
PCE ND
TCE 73,000
TCA 38,000
BPSI-SG2009 8 ft bgs 20 ft bgs 49 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 4.8 3.2 2.0
TCE 0.2 0.23 0.4
TCA 1.1 1.6 1.1
BPSI-SG2003 8 ft bgs 20 ft bgs 49 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 19 14 8.9
TCE 20 82 710
TCA 66 170 720
BPSI-SG2008 8 ft bgs 20 ft bgs 48 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 12.0 2.1 7.4
TCE 4.7 6.8 26.0
TCA 52 80 130
BPSI-SG2010 8 ft bgs 24 ft bgs 49 ft bgs
Compound ug/m3 ug/m3 ug/m3
PCE 3.7 4.9 2.3
TCE 2.8 19 5.5
TCA 1.4 2.2 1.0
N
LEGEND
OFFSITE SOIL GAS SAMPLE LOCATION
ONSITE SOIL GAS SAMPLE LOCATION
SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
420 SOIL GAS VALUE in ug/m3
J ESTIMATED VALUE
bgs BELOW GROUND SURFACE
PCE TETRACHLOROETHENE
TCE TRICHLOROETHENE
TCA 1,1,1 - TRICHLOROETHANE
PROPERTY LINE
FENCE LINE
SITE BOUNDARY
PARAMETER NYSDOH SUBSLAB VALUE ug/m3 NYSDOH INDOOR AIR VALUE ug/m3
Compound
PCE 1,000 100
TCE 250 5
TCA 1,000 NE
NOTE:
NYSDOH HAS NOT ESTABLISHED (NE) AN INDOOR AIR SCREENING VALUE FOR TCA.
0 100 200
SCALE IN FEET
TETRA TECH NUS, INC.
SOIL GAS SAMPLING RESULTS
JANUARY 2008 TO JANUARY 2009
SITE 1
NWIRP BETHPAGE
BETHPAGE, NEW YORK
FILE 112G01687GM02
SCALE AS NOTED
FIGURE NUMBER FIGURE 3
REV 0
DATE 04/24/09

APPENDIX B

COST ESTIMATES

TABLE B-0
ALTERNATIVES 1, 2, AND 3
SUMMARY OF COST ANALYSIS
SITE 1 EE/CA, NWIRP BETHPAGE, NY

ALTERNATIVE	ALTERNATIVE 1 NO ACTION			ALTERNATIVE 2 LONG-TERM OM&M OF ENGINEERING CONTROLS			ALTERNATIVE 3 SVE CONTAINMENT SYSTEM, ENGINEERING CONTROLS, AND OM&M		
Input	*(see Table B-1's)*			*(see Table B-2's)*			*(see Table B-3's)*		
Estimated time to meet RAOs [1]	*Greater than 30 Years*			*Greater than 30 Years*			*Greater than 30 Years*		
Timeframe used for cost estimate [2]	30 Years			30 Years			5 Years		
Real Discount Rate used for cost estimate [3]	2.7%			2.7%			1.6%		
Summary Costs	*-30%*	**Estimate**	*50%*	*-30%*	**Estimate**	*50%*	*-30%*	**Estimate**	*50%*
Capital Cost	*$0*	$0	*$0*	*$16,800*	$24,000	*$36,000*	*$835,800*	$1,194,000	*$1,791,000*
Present Value (2009) of Future Costs [3]	*$65,100*	$93,000	*$139,500*	*$1,655,500*	$2,365,000	*$3,547,500*	*$532,000*	$760,000	*$1,140,000*
TOTAL COST OF ALTERNATIVE [5] (2009 DOLLARS)	*$65,100*	**$93,000**	*$139,500*	*$1,672,300*	**$2,389,000**	*$3,583,500*	*$1,367,800*	**$1,954,000**	*$2,931,000*

Notes, Abbreviations, and References

Future costs include operation and maintenance (O&M) and monitoring (OM&M) and/or periodic costs. Future costs occur after Year 0 construction (i.e., implementation) capital costs. OM&M ensures the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

RAO - Removal Action Objective SVE - soil vapor extraction

1. Cleanup timeframes are estimated based on professional judgment and historical data, remedial actions, and removal actions. Effectiveness of natural attenuation mechanisms on chlorinated volatile organic compound (CVOC) soil vapor are not currently well-understood.

2. The timeframes of alternatives relying on natural attenuation of chlorinated volatile organic compound (CVOC) vapors cannot be accurately estimated/modeled without additional long-term data. Cost estimates for removal/remedial action timeframes greater than 30 years in this NTCRA EE/CA are evaluated on a 30-year-period per EPA (1988 and 2000), considering the effect of discounted future dollars with assumed certain economic conditions.

3. Real Discount Rates (R) are a forecast of real interest rates from which the inflation premium has been removed and based on the economic assumptions from the December 2010 Budget Baseline. These real rates are to be used for discounting constant-dollar flows, as is often required in cost-effectiveness analysis. The R used to calculate the PV for future costs over 5 years is 1.6%, and the R used for 30 years or more is 2.7% (OMB, 2008).

4. The information in the cost estimate is based on the best available information regarding the anticipated scope of each remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the design phase and pre-construction sampling. This is an order-of-magnitude engineering cost estimate that is expected to be within –30 to +50 percent of the actual project cost per EPA (1988 and 2000).

- OMB (Office of Management and Budget), 2008. *Circular A-94, Appendix C, Revised December 2008, "Discount Rates for Cost Effectiveness, Lease Purchase, and Related Analysis" for Calendar Year 2009*. http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/ .
- EPA (U.S. Environmental Protection Agency), 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* . OSWER Directive 9355.3-01. EPA/540/G-89/004. October.
- EPA, 1993. Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA. EPA/540-R-93-057. August.
- EPA, 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* . With the U.S. Army Corps of Engineers. OSWER Directive 9355.0-75. EPA 540-R-00-002. July.
- RS Means, 2007. *Site Work and Landscape Cost Data* . 26th Annual Edition

TABLE B-1a
ALTERNATIVE 1 - NO ACTION
PRESENT VALUE ANALYSIS
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Capital Cost: None (nothing to implement). APUs and SSDs were installed under the TCRA.
Future Costs (see Table B-1b): OM&M: None (no OM&M included). **Periodic:** Five-Year Reviews. No system shutdown or demobilization.

2.7% Real Discount Rate for 30-Year Period (OMB, 2008)[1]

Year		Capital Cost	Future OM&M Costs	Future Periodic Costs	Total Future Year Cost	Real Discount Rate at 2.7%	Present Value
0	2009	$0			$0	1	$0
1	2010		$0	$0	$0	0.974	$0
2	2011		$0	$0	$0	0.948	$0
3	2012		$0	$0	$0	0.923	$0
4	2013		$0	$0	$0	0.899	$0
5	2014		$0	$24,000	$24,000	0.875	$21,007
6	2015		$0	$0	$0	0.852	$0
7	2016		$0	$0	$0	0.830	$0
8	2017		$0	$0	$0	0.808	$0
9	2018		$0	$0	$0	0.787	$0
10	2019		$0	$24,000	$24,000	0.766	$18,387
11	2020		$0	$0	$0	0.746	$0
12	2021		$0	$0	$0	0.726	$0
13	2022		$0	$0	$0	0.707	$0
14	2023		$0	$0	$0	0.689	$0
15	2024		$0	$24,000	$24,000	0.671	$16,094
16	2025		$0	$0	$0	0.653	$0
17	2026		$0	$0	$0	0.636	$0
18	2027		$0	$0	$0	0.619	$0
19	2028		$0	$0	$0	0.603	$0
20	2029		$0	$24,000	$24,000	0.587	$14,086
21	2030		$0	$0	$0	0.572	$0
22	2031		$0	$0	$0	0.556	$0
23	2032		$0	$0	$0	0.542	$0
24	2033		$0	$0	$0	0.528	$0
25	2034		$0	$24,000	$24,000	0.514	$12,330
26	2035		$0	$0	$0	0.500	$0
27	2036		$0	$0	$0	0.487	$0
28	2037		$0	$0	$0	0.474	$0
29	2038		$0	$0	$0	0.462	$0
30	2039		$0	$24,000	$24,000	0.450	$10,792
						ALTERNATIVE 1 TOTAL PRESENT VALUE COST (2009 Dollars)	**$92,695**

Notes, Abbreviations, and References

APU - air purifying unit SSD - sub-slab depressurization unit TCRA - time-critical removal action (completed in May 2009)
OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

1. Real Discount Rates (R) are a forecast of real interest rates from which the inflation premium has been removed and based on the economic assumptions from the December 2010 Budget Baseline. These real rates are to be used for discounting constant-dollar flows, as is often required in cost-effectiveness analysis. The R used to calculate the Present Value (PV) for future costs over 30 years or more is 2.7% (OMB, 2008).

- OMB (Office of Management and Budget), 2008. *Circular A-94, Appendix C, Revised December 2008, "Discount Rates for Cost Effectiveness, Lease Purchase, and Related Analysis" for Calendar Year 2009* . http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/ .
- EPA (U.S. Environmental Protection Agency), 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* . OSWER Directive 9355.3-01. EPA/540/G-89/004. October.
- EPA, 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* . With the U.S. Army Corps of Engineers. OSWER Directive 9355.0-75. EPA 540-R-00-002. July.

- The information in this cost estimate is based on the best available information regarding the anticipated scope of the removal alternative (No Action, requiring future Five-Year Reviews). This is an order-of-magnitude engineering cost estimate that is expected to be within –30 to +50 percent of the actual project cost per EPA (1988 and 2000).

Table B-1b
ALTERNATIVE 1 - NO ACTION
FUTURE COSTS
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Item	Future OM&M Costs (none)	Future Periodic Costs (Every 5 Years)	Notes / Comments
Five-Year Review		$20,000	Five-Year Reviews required to confirm protectiveness of removal action / remedy until RAOs and cleanup levels are met. Assumes review effort would be performed in conjunction with other sites at NWIRP Bethpage.
Shutdown / Removal of APUs, SSDs, and SVPMs. Demobilization. Closeout Documentation.		none	No system shutdown included. Monitoring would be required to determine when the offsite engineering controls could be removed.
Subtotal	**$0**	**$20,000**	
Contingency @ 20%	*$0*	*$4,000*	
ALTERNATIVE 1 TOTAL FUTURE COSTS (for input into Present Value Analysis)	$0	$24,000	*Recurring costs if performed today.*

Notes and References

OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

RAO - Removal Action Objective

• EPA, 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* . With the U.S. Army Corps of Engineers. OSWER Directive 9355.0-75. EPA 540-R-00-002. July.

TABLE B-2a
ALTERNATIVE 2 - LONG-TERM OM&M OF ENGINEERING CONTROLS (APUs & SSDs)
PRESENT VALUE ANALYSIS
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Capital Cost (see Table B-2b): OM&M Plan.

Future Costs (see Tables B-2c, -2d, -2e, and -2.f):

OM&M: O&M of APUs and SSDs and Monitoring (indoor air, outdoor air, sub-slab vapor, and SSD-stack off-gas). Varying schedule during Year 1, Year 2, and Years 3-30.

Periodic: Five-Year Reviews. Eventual system shutdown and demobilization (assume at 30 years).

2.7% Real Discount Rate for 30-Year Period (OMB, 2008) [1]

Year		Capital Cost	Future OM&M Costs	Future Periodic Costs	Total Future Year Cost	Real Discount Rate at 2.7%	Present Value
0	2009	$23,232			$23,232	1	$23,232
1	2010		$164,541	$0	$164,541	0.974	$160,215
2	2011		$109,896	$0	$109,896	0.948	$104,194
3	2012		$107,282	$0	$107,282	0.923	$99,042
4	2013		$107,282	$0	$107,282	0.899	$96,438
5	2014		$107,282	$29,040	$136,322	0.875	$119,321
6	2015		$107,282	$0	$107,282	0.852	$91,434
7	2016		$107,282	$0	$107,282	0.830	$89,030
8	2017		$107,282	$0	$107,282	0.808	$86,689
9	2018		$107,282	$0	$107,282	0.787	$84,410
10	2019		$107,282	$29,040	$136,322	0.766	$104,439
11	2020		$107,282	$0	$107,282	0.746	$80,030
12	2021		$107,282	$0	$107,282	0.726	$77,926
13	2022		$107,282	$0	$107,282	0.707	$75,877
14	2023		$107,282	$0	$107,282	0.689	$73,883
15	2024		$107,282	$29,040	$136,322	0.671	$91,414
16	2025		$107,282	$0	$107,282	0.653	$70,049
17	2026		$107,282	$0	$107,282	0.636	$68,207
18	2027		$107,282	$0	$107,282	0.619	$66,414
19	2028		$107,282	$0	$107,282	0.603	$64,668
20	2029		$107,282	$29,040	$136,322	0.587	$80,013
21	2030		$107,282	$0	$107,282	0.572	$61,313
22	2031		$107,282	$0	$107,282	0.556	$59,701
23	2032		$107,282	$0	$107,282	0.542	$58,131
24	2033		$107,282	$0	$107,282	0.528	$56,603
25	2034		$107,282	$29,040	$136,322	0.514	$70,034
26	2035		$107,282	$0	$107,282	0.500	$53,666
27	2036		$107,282	$0	$107,282	0.487	$52,255
28	2037		$107,282	$0	$107,282	0.474	$50,881
29	2038		$107,282	$0	$107,282	0.462	$49,543
30	2039		$107,282	$46,464	$153,746	0.450	$69,134
						ALTERNATIVE 2 TOTAL PRESENT VALUE COST (2009 Dollars)	**$2,388,184**

Notes, Abbreviations, and References

APU - air purifying unit SSD - sub-slab depressurization unit

OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

1. Real Discount Rates (R) are a forecast of real interest rates from which the inflation premium has been removed and based on the economic assumptions from the December 2010 Budget Baseline. These real rates are to be used for discounting constant-dollar flows, as is often required in cost-effectiveness analysis. The R used to calculate the Present Value (PV) for future costs over 30 years or more is 2.7% (OMB, 2008).

- OMB (Office of Management and Budget), 2008. *Circular A-94, Appendix C, Revised December 2008, "Discount Rates for Cost Effectiveness, Lease Purchase, and Related Analysis" for Calendar Year 2009* . http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/.
- EPA (U.S. Environmental Protection Agency), 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* . OSWER Directive 9355.3-01. EPA/540/G-89/004. October.
- EPA, 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* . With the U.S. Army Corps of Engineers. OSWER Directive 9355.0-75. EPA 540-R-00-002. July.

- The information in this cost estimate is based on the best available information regarding the anticipated scope of the removal alternative (OM&M of Engineering Controls, requiring future Five-Year Reviews). This is an order-of-magnitude engineering cost estimate that is expected to be within –30 to +50 percent of the actual project cost per EPA (1988 and 2000).

TABLE B-2b
ALTERNATIVE 2 - LONG-TERM OM&M OF ENGINEERING CONTROLS (APUs & SSDs)
CAPITAL COST
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Assumptions:
No technology implementation: Engineering controls installed under TCRA.
Prepare non-UFP-SAP OM&M plan. Draft and Final versions.

	Item	Unit	Quantity	Unit Cost	Cost	Notes / Comments
1. OM&M Plan						
1.1	Project Management	month	6	$480	$2,880	$120 per hour; 4 hours/month.
1.2	Program / Senior Review	hours	16	$120	$1,920	Draft and Final OM&M Plans, including scoping and general support, senior review, and vapor intrusion and human health risk assessment specialties as appropriate.
1.3	Engineer	hours	160	$90	$14,400	Recent similar project plan.
				Subtotal	**$19,200**	
			Contractor Overhead/Profit @	*10%*	*$1,920*	RS Means (2007) 01 21 16 16.50 0020; EPA (2000).
				Subtotal	**$21,120**	
			Contingency @	*10%*	*$2,112*	RS Means (2007) 01 31 13.80 0150; EPA (2000).
				ALTERNATIVE 2 TOTAL YEAR 0 CAPITAL COST	**$23,232**	

Notes and References
OM&M - operation and maintenance (O&M) and monitoring (OM&M) UFP-SAP - [Navy] Uniform Federal Policy Sampling and Analysis Plan
• RS Means, 2007. *Site Work and Landscape Cost Data*. 26th Annual Edition

TABLE B-2d
ALTERNATIVE 2 - LONG-TERM OM&M OF ENGINEERING CONTROLS (APUs & SSDs)
BACKUP FOR FUTURE OM&M COST - YEAR 1
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Year 1 Assumptions:
All OM&M site work performed locally.
O&M: 12 APUs and 6 SSDs.
(a) O&M includes electricity and miscellaneous repairs. O&M labor performed during sampling events when possible.
(b) Quarterly HEPA filter replacement on APUs. No GAC replacement needed for SSDs in Year 1 (GAC replacement on APUs biannually [once per 2 years]).
Monitoring:
(a) Indoor air, ambient-outdoor air, and sub-slab samples are collected over 24 hours. SSD-stack-off-gas samples are collected over 30 minutes.
(b) Baseline sampling conducted under TCRA. NTCRA Monitoring Events during Year 1 are in March and September 2010.
(c) Air/gas sample analysis for CVOCs by EPA Method TO-15 modified. One duplicate sample collected per 10 samples. Six duplicates per Monitor Event during Year 1 based on sample count/event (12+16+10+15=53) in (d), (e), (f), & (g) below.
(d) Four houses with one APU each, only. Each event: One sample each for indoor air, sub-slab vapor, and ambient-outdoor air at each house. Total 3 samples per house = 12 samples/event.
(e) Four houses with one APU and one SSD each. Each event: One sample each for indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 4 samples per house = 16 samples/event.
(f) Two houses with two APUs and one SSD each. Each event: One sample each for basement-indoor air, living-space-indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 5 samples per house = 10 samples/event.
(g) Five houses do not have APUs nor SSDs. Each event: One sample each for indoor air, sub-slab vapor, and ambient-outdoor air at each house. Total 3 samples per house = 15 samples/event.

	Item	Unit	Quantity	Unit Cost	Cost	Notes / Comments
1.	**O&M of Offsite Engineering Controls (APUs & SSDs) - Year 1**					
1.1	Project Management	month	12	$480	$5,760	$120 per hr; 4 hrs/month. 12 months.
1.2	HEPA Filter replacement on APU	event	4	$2,296	$9,184	Four O&M Events during Year 1: • HEPA filter switch-outs on each of the 12 APUs (1 filter/APU). • $120/HEPA filter ($1,440/event). • 2-person crew. Labor at $35 per hr; 10 working hrs/day; ~1 hr labor per switch-out. Assume 8 filters per day. Therefore, 2 days/event considering local travel and residential coordination. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). • Incidental expenses and equipment ($500/event)
1.3	Granular Activated Carbon replacement *None during Year 1*	event	0	$3,600	$0	None during Year 1. Occurs biannually. First switch-out during Year 2. • GAC-cartridges switch-out on 6 SSDs (one set of cartridges per SSD). • $600/GAC-cartridges (including disposal). • Labor for GAC switch-out covered by HEPA filter switch-out labor.
1.4	Electricity for APUs and SSDs	Unit-Year	18	$400	$7,200	12 APUs and 6 SSDs to be powered. $400/year per APU or SSD unit.
1.5	Miscellaneous Parts and Repairs	Annual	1	$2,516	$2,516	• Assume $1,000/yr for parts & repairs as necessary. • Assume 2-person crew, 16 hrs/yr per person ($35/hr), 2 days vehicle ($70/day/team), and 2 days per-diem ($64/person/day).
				Subtotal	**$24,660**	
2.	**Monitoring of Offsite Engineering Controls (APUs and SSDs) - Year 1**					
2.1	Project Management	month	12	$480	$5,760	$120 per hr; 4 hrs/month. 12 months.
2.2	Field Sampling *March and September 2010*	event	2	$11,980	$23,960	Two Sampling Events per 'Monitoring Assumptions' (above): • 2-person crew. Labor at $35 per hr; 10 working hrs/day. • Sample 6-8 residences/wk. Therefore, 2 weeks (10 days / 100 hrs) per person per event. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). • Incidental expenses, shipping, and sampling/H&S equipment and expendables ($3,000/event).
2.3	Analytical	event	2	$18,970	$37,940	Two Sampling Events per 'Monitoring Assumptions' (above): • 59 samples (including duplicates) per event by EPA TO-15 modified. • Data management labor at $60/hr. 32 hrs/event. • Data validation labor at $70/hr. 16 hrs/event.
2.4	Annual OM&M Report	each	1	$21,000	$21,000	Data presentation, evaluation, and recommendations. Draft and Final. Includes labor and ODCs.
				Subtotal	**$88,660**	
				ALTERNATIVE 2 TOTAL OM&M COST FOR YEAR 1	**$113,320**	Note: Multipliers are applied to future costs on Table B-2c

Notes, Abbreviations, and References
APU - air purifying unit SSD - sub-slab depressurization unit TCRA - time-critical removal action NTCRA - non-TCRA
GAC - granular activated carbon CVOC - chlorinated volatile organic carbon hr - hour yr - year
OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

TABLE B-2e
ALTERNATIVE 2 - LONG-TERM OM&M OF ENGINEERING CONTROLS (APUs & SSDs)
BACKUP FOR FUTURE OM&M COST - YEAR 2
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Year 2 Assumptions:

All OM&M site work performed locally.

O&M: 12 APUs and 6 SSDs.

(a) O&M includes electricity and miscellaneous repairs. O&M labor performed during sampling events when possible.

(b) Quarterly HEPA filter replacement on APUs. GAC replacement for SSDs in Year 2 (GAC replacement on APUs biannually [once per 2 years]).

Monitoring:

(a) Indoor air, ambient-outdoor air, and sub-slab samples are collected over 24 hours. SSD-stack-off-gas samples are collected over 30 minutes.

(b) The Year 2 Sampling Event would be in September 2011. Sampling events for Years 3-30 would occur annually in September.

(c) Air/gas sample analysis for CVOCs by EPA Method TO-15 modified. One duplicate sample collected per 10 samples. Four duplicates per Monitor Event during Year 2 based on sample count/event (12+16+10=38) in (d), (e), and (f) below.

(d) Four houses with one APU each, only. Each event: One sample each for indoor air, sub-slab vapor, and ambient-outdoor air at each house. Total 3 samples per house = 12 samples/event.

(e) Four houses with one APU and one SSD each. Each event: One sample each for indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 4 samples per house = 16 samples/event.

(f) Two houses with two APUs and one SSD each. Each event: One sample each for basement-indoor air, living-space-indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 5 samples per house = 10 samples/event.

(g) It is assumed that the five houses without APUs or SSDs would not be sampled after Year 1 (i.e., no monitoring in the five-houses-without-APUs-or-SSDs during Year 2 or Years 3-30).

	Item	Unit	Quantity	Unit Cost	Cost	Notes / Comments
1. O&M of Offsite Engineering Controls (APUs & SSDs) - Year 2						
1.1	Project Management	month	12	$480	$5,760	$120 per hr; 4 hrs/month. 12 months.
1.2	HEPA Filter replacement on APU	event	4	$2,296	$9,184	Four O&M Events during Year 2: • HEPA filter switch-outs on each of the 12 APUs (1 filter/APU). • $120/HEPA filter ($1,440/event). • 2-person crew. Labor at $35 per hr; 10 working hrs/day; ~1 hr labor per switch-out. Assume 8 filters per day. Therefore, 2 days/event considering local travel and residential coordination. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). • Incidental expenses and equipment ($500/event).
1.3	Granular Activated Carbon replacement	event	1	$3,600	$3,600	First switch-out during Year 2. Occurs biannually. • GAC-cartridges switch-out on 6 SSDs (one set of cartridges per SSD). • $600/GAC-cartridges (including disposal). • Labor for GAC switch-out covered by HEPA filter switch-out labor.
1.4	Electricity for APUs and SSDs	Unit-Year	18	$400	$7,200	12 APUs and 6 SSDs to be powered. $400/year per APU or SSD unit.
1.5	Miscellaneous Parts and Repairs	Annual	1	$2,516	$2,516	• Assume $1,000/yr for parts & repairs as necessary. • Assume 2-person crew, 16 hrs/yr per person ($35/hr), 2 days vehicle ($70/day/team), and 2 days per-diem ($64/person/day).
				Subtotal	**$28,260**	
2. Annual Monitoring of Offsite Engineering Controls (APUs and SSDs) - Year 2						
2.1	Project Management	month	12	$480	$5,760	$120 per hr; 4 hrs/month. 12 months.
2.2	Field Sampling *September 2011*	event	1	$9,286	$9,286	One Sampling Event per 'Monitoring Assumptions' (above): • 2-person crew. Labor at $35 per hr; 10 working hrs/day. • Sample 6-8 residences/wk. Therefore, just over 1 week (7 days / 70 hrs) per person per event. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). • Incidental expenses, shipping, and sampling/H&S equipment and expendables ($3,000/event).
2.3	Analytical	event	1	$14,380	$14,380	One Sampling Event per 'Monitoring Assumptions' (above): • 42 samples (including duplicates) during Year 2 Sampling Event by EPA TO-15 modified. • Data management labor at $60/hr. 32 hrs/event. • Data validation labor at $70/hr. 16 hrs/event.
2.4	Annual OM&M Report	each	1	$18,000	$18,000	Data presentation, evaluation, and recommendations. Draft and Final. Includes labor and ODCs.
				Subtotal	**$47,426**	
				ALTERNATIVE 2 TOTAL OM&M COST FOR YEAR 2	**$75,686**	Note: Multipliers are applied to future costs on Table B-2c

Notes, Abbreviations, and References

APU - air purifying unit SSD - sub-slab depressurization unit TCRA - time-critical removal action NTCRA - non-TCRA

GAC - granular activated carbon CVOC - chlorinated volatile organic carbon hr - hour yr - year

OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

TABLE B-2f
ALTERNATIVE 2 - LONG-TERM OM&M OF ENGINEERING CONTROLS (APUs & SSDs)
BACKUP FOR FUTURE OM&M COST - YEARS 3-30
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Annual Assumptions for Years 3-30:
All OM&M site work performed locally.
O&M: 12 APUs and 6 SSDs.
(a) O&M includes electricity and miscellaneous repairs. O&M labor performed during sampling events when possible.
(b) Quarterly HEPA filter replacement on APUs. GAC replacement for SSDs in Years 4, 6, 8,... and 30 (GAC replacement on APUs biannually [once per 2 years]) (half of the GAC cost in each of Years 3-30).
Monitoring:
(a) Indoor air, ambient-outdoor air, and sub-slab samples are collected over 24 hrs. SSD-stack-off-gas samples are collected over 30 minutes.
(b) Each annual sampling event during Years 3-30 would occur in September starting in 2012.
(c) Air/gas sample analysis for CVOCs by EPA Method TO-15 modified. One duplicate sample collected per 10 samples. Four duplicates per Monitor Event during Year 2 based on sample count/event (12+16+10=38) in (d), (e), and (f) below.
(d) Four houses with one APU each, only. Each event: One sample each for indoor air, sub-slab vapor, and ambient-outdoor air at each house. Total 3 samples per house = 12 samples/event.
(e) Four houses with one APU and one SSD each. Each event: One sample each for indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 4 samples per house = 16 samples/event.
(f) Two houses with two APUs and one SSD each. Each event: One sample each for basement-indoor air, living-space-indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 5 samples per house = 10 samples/event.

	Item	Unit	Quantity	Unit Cost	Cost	Notes / Comments
1. O&M of Offsite Engineering Controls (APUs & SSDs) - Annual cost for each of Years 3-30						
1.1	Project Management	month	12	$480	$5,760	$120 per hr; 4 hrs/month. 12 months.
1.2	HEPA Filter replacement on APU	event	4	$2,296	$9,184	Four O&M Events during each of Years 3-30: • HEPA filter switch-outs on each of the 12 APUs (1 filter/APU). • $120/HEPA filter ($1,440/event). • 2-person crew. Labor at $35 per hr; 10 working hrs/day; ~1 hr labor per switch-out. Assume 8 filters per day. Therefore, 2 days/event considering local travel and residential coordination. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). • Incidental expenses and equipment ($500/event).
1.3	Granular Activated Carbon replacement *biannually*	event	1	$1,800	$1,800	Switch-out during Years 4, 6, 8,... and 30 (biannually). (Use half of the GAC unit cost during each of Years 3-30). • GAC-cartridges switch-out on 6 SSDs (one set of cartridges per SSD). • $600/GAC-cartridges (including disposal). • Labor for GAC switch-out covered by HEPA filter switch-out labor.
1.4	Electricity for APUs and SSDs	Unit-Year	18	$400	$7,200	12 APUs and 6 SSDs to be powered. $400/year per APU or SSD unit.
1.5	Miscellaneous Parts and Repairs	Annual	1	$2,516	$2,516	• Assume $1,000/yr for parts & repairs as necessary. • Assume 2-person crew, 16 hrs/yr per person ($35/hr), 2 days vehicle ($70/day/team), and 2 days per-diem ($64/person/day).
				Subtotal	**$26,460**	
2. Annual Monitoring of Offsite Engineering Controls (APUs and SSDs) - Each of Years 3-30						
2.1	Project Management	month	12	$480	$5,760	$120 per hr; 4 hrs/month. 12 months.
2.2	Field Sampling	event	1	$9,286	$9,286	One Sampling Event/yr per 'Monitoring Assumptions' (above): • 2-person crew. Labor at $35 per hr; 10 working hrs/day. • Sample 6-8 residences/wk. Therefore, just over 1 week (7 days / 70 hrs) per person per event. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). • Incidental expenses, shipping, and sampling/H&S equipment and expendables ($3,000/event).
2.3	Analytical	event	1	$14,380	$14,380	One Sampling Event/yr per 'Monitoring Assumptions' (above): • 42 samples (including duplicates) during each of the sampling events during Years 3-30 by EPA TO-15 modified. • Data management labor at $60/hr. 32 hrs/event. • Data validation labor at $70/hr. 16 hrs/event.
2.4	Annual OM&M Report	each	1	$18,000	$18,000	Data presentation, evaluation, and recommendations. Draft and Final. Includes labor and ODCs.
				Subtotal	**$47,426**	
				ALTERNATIVE 2 **TOTAL ANNUAL OM&M COST FOR EACH OF YEARS 3-30**	**$73,886**	Note: Multipliers are applied to future costs on Table B-2c

Notes, Abbreviations, and References
APU - air purifying unit SSD - sub-slab depressurization unit TCRA - time-critical removal action NTCRA - non-TCRA
GAC - granular activated carbon CVOC - chlorinated volatile organic carbon hr - hour yr - year
OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

TABLE B-3a
ALTERNATIVE 3 - SVE CONTAINMENT SYSTEM, ENGINEERING CONTROLS, AND OM&M
PRESENT VALUE ANALYSIS
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Capital Cost (see Table B-3b): Removal Action Work Plan / OM&M Plan. Install SVE Containment System. OM&M of SVE Containment System and Offsite

Future Costs (see Tables B-3c, -3d, and -3e):

OM&M: O&M of SVE Containment System, APUs, and SSDs and Monitoring (SVE off-gas, SVPMs, indoor air, outdoor air, sub-slab vapor, and SSD-stack off-gas). Varying schedule during Year 1, Year 2, and Years 3-5. APUs and SSDs shut down after 2 years.

Periodic: Five-Year Review. System shutdown and demobilization at 5 years.

1.6% Real Discount Rate for 5-Year Period (OMB, 2008) [1]

Year		Capital Cost	Future OM&M Costs	Future Periodic Costs	Total Future Year Cost	Real Discount Rate at 100%	Present Value
0	2009	$1,193,089			$1,193,089	1	$1,193,089
1	2010		$272,200	$0	$272,200	0.984	$267,913
2	2011		$172,456	$0	$172,456	0.969	$167,067
3	2012		$79,776	$17,424	$97,200	0.953	$92,680
4	2013		$79,776	$0	$79,776	0.938	$74,868
5	2014		$79,776	$90,024	$169,800	0.924	$156,844
						ALTERNATIVE 3 TOTAL PRESENT VALUE COST (2009 Dollars)	**$1,952,462**

Notes and References

APU - air purifying unit SSD - sub-slab depressurization unit

OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

1. Real Discount Rates (R) are a forecast of real interest rates from which the inflation premium has been removed and based on the economic assumptions from the December 2010 Budget Baseline. These real rates are to be used for discounting constant-dollar flows, as is often required in cost-effectiveness analysis. The R used to calculate the Present Value (PV) for future costs over 5 years is 1.6% (OMB, 2008).

- OMB (Office of Management and Budget), 2008. *Circular A-94, Appendix C, Revised December 2008, "Discount Rates for Cost Effectiveness, Lease Purchase, and Related Analysis" for Calendar Year 2009*. http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/.
- EPA (U.S. Environmental Protection Agency), 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. OSWER Directive 9355.3-01. EPA/540/G-89/004. October.
- EPA, 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. With the U.S. Army Corps of Engineers. OSWER Directive 9355.0-75. EPA 540-R-00-002. July.

- The information in this cost estimate is based on the best available information regarding the anticipated scope of the removal alternative (SVE Containment System, Engineering Controls, and OM&M, with Five-Year Reviews). This is an order-of-magnitude engineering cost estimate that is expected to be within –30 to +50 percent of the actual project cost per EPA (1988 and 2000).

TABLE B-3b
ALTERNATIVE 3 - SVE CONTAINMENT SYSTEM, ENGINEERING CONTROLS, AND OM&M
CAPITAL COST
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Assumptions:
Install SVE Containment System during Year 0. OM&M of SVE Containment System and Offsite Engineering Controls during Year 0.
Prepare non-UFP-SAP OM&M plan. Draft and Final versions.

Item	Quantity	Unit	Unit Cost				Extended Cost				Subtotal	Notes / Comments
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment		
1. PRE-CONSTRUCTION AND DOCUMENTS												
1.1 Prepare Remedial Action Plan	400	hr		$12.00	$50.00		$0	$4,800	$20,000	$0	$24,800	
1.2 Prepare LUC RD	200	hr			$37.00		$0	$0	$7,400	$0	$7,400	
1.3 Survey Support	2	days	$1,800.00				$3,600	$0	$0	$0	$3,600	
2. MOBILIZATION/DEMOBILIZATION												
2.1 Field Office Support	3	mo		$143.00		$0.00	$0	$429	$0	$0	$429	
2.2 PPE	2	mo		$140.00		$0.00	$0	$280	$0	$0	$280	
2.3 Site Utilities (Phone & Electric)	3	mo		$302.00			$0	$906	$0	$0	$906	
2.4 Mobilization/Demobilization Construction Equipment	2	ea			$147.00	$350.00	$0	$0	$294	$700	$994	
3. DECONTAMINATION												
3.1 Decontamination Services	1	mo		$375.00		$900.00	$0	$375	$0	$900	$1,275	
3.2 Pressure Washer	1	mo		$375.00			$0	$375	$0	$0	$375	
3.3 Equipment Decon Pad	1	ls		$500.00	$450.00	$155.00	$0	$500	$450	$155	$1,105	
3.4 Decon Water Storage Tank, 1,000 gallon	1	mo				$550.00	$0	$0	$0	$550	$550	
3.5 Clean Water Storage Tank, 1,000 gallon	1	mo				$500.00	$0	$0	$0	$500	$500	
3.6 Disposal of Decon Water & Well Develop	2,900	gal	$0.50				$1,450	$0	$0	$0	$1,450	
4. SITE PREPARATION												
4.1 Clearing & Grubbing	0.20	ac			$1,250.00	$2,875.00	$0	$0	$250	$575	$825	
4.2 Brush Disposal	1	ea	$500.00		$500.00		$500	$0	$500	$0	$1,000	
4.3 Fence Removal	1,000	feet			$10.00		$0	$0	$10,000	$0	$10,000	
4.4 Fence Disposal	2	box	$500.00				$1,000	$0	$0	$0	$1,000	
5. Well Installation & SVPM												
5.1 SVE Wells	10	wells	$4,500.00				$45,000	$0	$0	$0	$45,000	
5.2 Protective Casing	12	each	$250.00				$3,000	$0	$0	$0	$3,000	
5.3 Well Development	6	each	$400.00				$2,400	$0	$0	$0	$2,400	
5.4 SVPM Wells	9	wells	$350.00				$3,150	$0	$0	$0	$3,150	
5.5 TOB fees	9	each	$1,500.00				$13,500	$0	$0	$0	$13,500	
6. PIPING INSTALLATION												
6.1 Laborer (2)	40	days			$259.00		$0	$0	$10,360	$0	$10,360	
6.2 2 inch Piping	3,240	feet		$2.00			$0	$6,480	$0	$0	$6,480	
6.3 10 inch Piping	1,280	feet		$15.00			$0	$19,200	$0	$0	$19,200	
6.4 Excavator (1.5 cy) & Operator (trench)	15	days			$277.20	$591.02	$0	$0	$4,158	$8,865	$13,023	
6.5 8 inch piping	200	feet		$11.00			$0	$2,200	$0	$0	$2,200	
6.6 8 inch steel Piping/fitting/valve	8	feet		$750.00			$0	$6,000	$0	$0	$6,000	
6.7 PVC Values & Fittings - 2 inch	45	each		$22.00			$0	$990	$0	$0	$990	
6.8 PVC Values & Fittings - 8/10	25	each		$550.00			$0	$13,750	$0	$0	$13,750	
6.9 Flow Monitoring Station	1	each		$7,500.00			$0	$7,500	$0	$0	$7,500	
6.10 Bedding material	330	ton		$18.00			$0	$5,940	$0	$0	$5,940	
7. TREATMENT SYSTEM												
7.1 Moisture Separator	1	each		$7,500.00			$0	$7,500	$0	$0	$7,500	
7.2 Blowers	2	each		$4,500.00			$0	$9,000	$0	$0	$9,000	
7.3 Flow Meter	1	each		$1,100.00			$0	$1,100	$0	$0	$1,100	
7.4 Laborer (2)	40	days			$259.00		$0	$0	$10,360	$0	$10,360	
7.5 Stack (schedule 80 pack)	1	each		$750.00		$2,500.00	$0	$750	$0	$2,500	$3,250	
7.6 Electrical and Lighting	1	each		$10,000.00	$4,500.00		$0	$10,000	$4,500	$0	$14,500	
7.7 Heating/Ventilation	1	each		$4,000.00	$2,250.00		$0	$4,000	$2,250	$0	$6,250	
7.8 Vacuum Relief valve	1	each		$1,500.00			$0	$1,500	$0	$0	$1,500	
7.9 Controls/telemetry	1	each		$17,000.00	$4,500.00		$0	$17,000	$4,500	$0	$21,500	
7.1 8 inch hose	1	each		$420.00			$0	$420	$0	$0	$420	
8. STARTUP AND FIRST YEAR O&M												
8.1 Project Management	96	hours			$ 45.00		$0	$0	$4,320	$0	$4,320	$45/hr; 10hrs/day plus $326/day
8.2 Engineer	20	days		$ 326.00	$ 450.00		$0	$6,520	$9,000	$0	$15,520	$45/hr; 10hrs/day plus $326/day
8.3 Field Sampling	16	days		$326.00	$300.00		$0	$5,216	$4,800	$0	$10,016	$30/hr; 10hrs/day plus $326/day
8.4 Monthly Monitoring	24	days		$326.00	$300.00		$0	$7,824	$7,200	$0	$15,024	$30/hr; 10hrs/day plus $326/day
8.5 Analytical	74	each	$270.00		$100.00		$19,980	$0	$7,400	$0	$27,380	
8.6 Reporting	4	reports		$750.00	$3,500.00		$0	$3,000	$14,000	$0	$17,000	
9. CONSTRUCTION OVERSIGHT												
9.1 Field Supervisor	67	day		$326.00	$510.00		$0	$21,842	$34,170	$0	$56,012	$51/hr; 10hrs/day plus $326/day
9.2 Field Geologist	10	day		$326.00	$350.00		$0	$3,260	$3,500	$0	$6,760	$35/hr; 10hrs/day plus $326/day
9.3 H&S	45	day		$326.00	$350.00		$0	$14,670	$15,750	$0	$30,420	$35/hr; 10hrs/day plus $326/day
9.4 Post Construction Documents	600	hr		$12.00	$60.00		$0	$7,200	$36,000	$0	$43,200	
						Subtotal	**$93,580**	**$190,527**	**$211,162**	**$14,745**	**$510,014**	
						Local Area Adjustments @	*100.0%*	*112.3%*	*130.4%*	*100.0%*		
						Subtotal	**$93,580**	**$213,962**	**$275,355**	**$14,745**	**$597,642**	
						Overhead on Labor Cost @ 50%			*$137,678*		*$137,678*	
						G & A on Labor Cost @ 30%			*$82,607*		*$82,607*	
						G & A on Material Cost @ 10%		*$21,396*			*$21,396*	
						G & A on Equipment Cost @ 10%				*$1,475*	*$1,475*	
						G & A on Subcontract Cost @ 5%	*$4,679*				*$4,679*	
						Total Direct Cost	**$98,259**	**$235,358**	**$495,639**	**$16,220**	**$845,476**	
						Indirects on Total Direct Cost @ 15%					*$124,354*	
						Profit on Total Direct Cost @ 8%					*$67,638*	
						Subtotal					**$1,037,468**	
						Contingency @ 15%					*$155,620*	
						ALTERNATIVE 3 **TOTAL CAPITAL COST**					**$1,193,089**	

TABLE B-3c
ALTERNATIVE 3 - SVE CONTAINMENT SYSTEM, ENGINEERING CONTROLS, AND OM&M
FUTURE COSTS
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Item	OM&M Costs			Periodic Costs		Notes / Comments
	(Year 1)	Annual (Year 2)	Annual (Years 3-5)	(Year 3)	(Year 5)	
OM&M during Year 1: SVE Containment System and Offsite Engineering Controls (APUs and SSDs)	$187,466					OM&M cost during Year 1 (March and September 2010). See Table B-3d. Note: Five residences without APUs or SSDs (monitoring only during Year 1) would be removed from OM&M program after Year 1.
Annual OM&M during Year 2: SVE Containment System and Offsite Engineering Controls (APUs and SSDs)		$118,772				OM&M cost during Year 2 (September 2011). See Table B-3e. Note: Assume offsite Enginering Controls shut down after Year 2.
Annual OM&M during Years 3-5: SVE Containment System			$54,942			OM&M cost for SVE Containment System during each of Years 3, 4, and 5 (September 2012, September 2013, and September 2014). (see Table B-3e).
Shutdown / Removal and demobilization of engineering controls (APUs and SVEs) after Year 2 (i.e., during Year 3)				$12,000		Assume Offsite Engineering Controls shut down after 2 years of SVE operation. The APUs, SSDs, SSD-piping and conduits, etc. would be removed appropriately. Navy retains the APUs and SSD equipment for use elsewhere or storage.
Five-Year Review (Year 5)					$20,000	Five-Year Reviews required to confirm protectiveness of removal action / remedy until RAOs and cleanup levels are met.
SVE Containment System GAC disposal (Year 5)					$12,000	Characterization and disposal of GAC treatment material from the SVE Containment System. Assume GAC stays through Year 5 (although probably only needed through Year 1).
Shutdown / Removal and demobilization of SVE Containment System. Closeout Documentation. (Year 5)					$30,000	Assume SVE Containment System shuts down at 5 years. SVPMs would be abandoned. SVE Containment System components would be removed and/or abandoned appropriately (includes GAC disposal). Navy retains the SVE blowers for use elsewhere or storage. Closeout documentation would be prepared to detail NFA for VOCs in soil / soil vapor media at Site 1 (pending other actions for metals and PCBs in soil at Site 1, and facility-wide/offsite groundwater.
Subtotal	**$187,466**	**$118,772**	**$54,942**	**$12,000**	**$62,000**	
General Conditions @ 10%	*$18,747*	*$11,877*	*$5,494*	*$1,200*	*$6,200*	RS Means (2007) Page vi, General Conditions.
Subtotal	**$206,212**	**$130,649**	**$60,436**	**$13,200**	**$68,200**	
Contractor Overhead/Profit @ 10%	*$20,621*	*$13,065*	*$6,044*	*$1,320*	*$6,820*	RS Means (2007) 01 31 13.80 0150; EPA (2000).
Subtotal	**$226,833**	**$143,714**	**$66,480**	**$14,520**	**$75,020**	
Contingency @ 20%	*$45,367*	*$28,743*	*$13,296*	*$2,904*	*$15,004*	RS Means (2007) 01 21 16 16.50 0020; EPA (2000).
ALTERNATIVE 3 **TOTAL FUTURE PERIODIC COST** (for input into Present Value Analysis)	**$272,200**	**$172,456**	**$79,776**	**$17,424**	**$90,024**	*Costs if performed today.*

Notes and References

OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

- RS Means, 2007. *Site Work and Landscape Cost Data*. 26th Annual Edition
- EPA, 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. With the U.S. Army Corps of Engineers. OSWER Directive 9355.0-75. EPA 540-R-00-002. July.

TABLE B-3d
ALTERNATIVE 3 - SVE CONTAINMENT SYSTEM, ENGINEERING CONTROLS, AND OM&M
BACKUP FOR FUTURE OM&M COST - YEAR 1
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Year 1 Assumptions
All OM&M site work performed locally.
O&M: 12 APUs and 6 SSDs. SVE Containment System (12 SVE Wells and 12 SVPMs).
(a) O&M includes electricity and miscellaneous repairs. O&M labor performed during sampling events when possible.
(b) Quarterly HEPA filter replacement on APUs. No GAC replacement needed for SSDs in Year 1 (GAC replacement on APUs biannually [once per 2 years]).
(c) Monthly O&M for SVE Containment System during Year 1.
Monitoring:
(a) Indoor air, ambient-outdoor air, and sub-slab samples are collected over 24 hours. SSD-stack-off-gas samples are collected over 30 minutes.
(b) Baseline sampling conducted under TCRA. NTCRA Monitoring Events during Year 1 are in March and September 2010.
(c) Air/gas sample analysis for CVOCs by EPA Method TO-15 modified. One duplicate sample collected per 10 samples. Six duplicates per Monitor Event during Year 1 based on sample count/event (12+16+10+15=53) in (d), (e), (f), & (g) below.
(d) Four houses with one APU each, only. Each event: One sample each for indoor air, sub-slab vapor, and ambient-outdoor air at each house. Total 3 samples per house = 12 samples/event.
(e) Four houses with one APU and one SSD each. Each event: One sample each for indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 4 samples per house = 16 samples/event.
(f) Two houses with two APUs and one SSD each. Each event: One sample each for basement-indoor air, living-space-indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 5 samples per house = 10 samples/event.
(g) Five houses do not have APUs nor SSDs. Each event: One sample each for indoor air, sub-slab vapor, and ambient-outdoor air at each house. Total 3 samples per house = 15 samples/event.
(h) SVE Containment System - Baseline Sampling (under Capital). Quarterly sampling during Year 1. Semiannual sampling during Years 2-5. TO-15 modified (30-minute SUMMA) and one duplicate per 10 samples. In addition, semiannual collection of SVPM vacuum readings.
(i) SVE Containment System - Pre-GAC-treatment vapor and System Off-gas samples at 1, 2, 3, 6, 9, and 12 months. Off-gas samples from each of the 12 SVE wells quarterly. Therefore, 14 samples plus 2 duplicates quarterly during Year 1. Two samples plus 1 duplicate during Months 1 and 2. SVPM vacuum readings at variable depths.

	Item	Unit	Quantity	Unit Cost	Cost	Notes / Comments
1. Quarterly O&M of Offsite Engineering Controls (APUs & SSDs) - Year 1						
1.1	Project Management	month	12	$480	$5,760	$120 per hour; 4 hours/month. 12 months.
1.2	HEPA Filter replacement on APU	event	4	$2,296	$9,184	Four O&M Events during Year 1: • HEPA filter switch-outs on each of the 12 APUs (1 filter/APU). $120/HEPA filter ($1,440/event) • 2-person crew. Labor at $35 per hour; 10 working hours/day; ~1 hr labor per switch-out. Assume 8 filters per day. Therefore, 2 days/event considering local travel and residential coordination. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). Incidental expenses and equipment ($500/event)
1.3	Granular Activated Carbon replacement *None during Year 1*	event	0	$3,600	$0	None during Year 1. Occurs biannually. First switch-out during Year 2. • GAC-cartridges switch-out on 6 SSDs (one set of cartridges per SSD). $600/GAC-cartridges (including disposal). Labor for GAC switch-out covered by HEPA filter switch-out labor.
1.4	Electricity for APUs and SSDs	Unit-Year	18	$400	$7,200	12 APUs and 6 SSDs to be powered. $400/year per APU or SSD unit.
1.5	Miscellaneous Parts and Repairs	Annual	1	$2,516	$2,516	• Assume $1,000/yr for parts & repairs as necessary. • Assume 2-person crew, 16 hours/yr per person ($35/hr), 2 days vehicle ($70/day/team), and 2 days per-diem ($64/person/day).
				Subtotal	**$24,660**	
2. Monthly O&M of SVE Containment System - Year 1						
2.1	Project Management	month	12	$960	$11,520	$120 per hour; 8 hours/month. 12 months.
2.2	Technician	month	12	$434	$5,208	Monthly O&M Events during Year 1: system status and vacuum readings. 1 technician at $30/hr for one 10-hr day. Assume $2,000/yr for parts & repairs as necessary.
2.3	SVE vapor condensate disposal	Annual	1	$2,058	$2,058	Dispose approximately 500 gallons SVE vapor condensate per year. Including labor, waste characterization, and nonhazardous disposal.
2.4	Electricity for SVE Containment System	Annual	1	$6,000	$6,000	SVE Blower system and miscellaneous electronics (e.g., heating and lighting) - $6000/year based on $0.208/Kw-hr (LIPA, March 2009)
2.5	Miscellaneous Parts and Repairs	Annual	1	$2,000	$2,000	• Assume $2,000/yr for parts & repairs as necessary. Labor covered above.
				Subtotal	**$26,786**	
3. Monitoring of Offsite Engineering Controls (APUs and SSDs) - Year 1						
3.1	Project Management	month	12	$480	$5,760	$120 per hour; 4 hours/month. 12 months.
3.2	Field Sampling *March and September 2010*	event	2	$11,980	$23,960	Two Sampling Events per 'Monitoring Assumptions' (above): • 2-person crew. Labor at $35 per hour; 10 working hours/day. Sample 6-8 residences/wk. Therefore, 2 weeks (10 days / 100 hrs) per person per event. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). Incidental expenses, shipping, and sampling/H&S equipment and expendables ($3,000/event).
3.3	Analytical	event	2	$18,970	$37,940	Two Sampling Events per 'Monitoring Assumptions' (above): • 59 samples (including duplicates) per event by EPA TO-15 modified. Data management labor at $60/hr. 32 hrs/event. Data validation labor at $70/hr. 16 hrs/event.
3.4	Annual OM&M Report	each	1	$27,000	$27,000	SVE Containment System and Engineering Controls OM&M Report. Data presentation, evaluation, and recommendations. Draft and Final. Includes labor and ODCs.
				Subtotal	**$94,660**	
4. Monitoring of SVE Containment System - Year 1						
4.1	Project Management	month	12	$480	$5,760	$120 per hour; 4 hours/month. 12 months.
4.2	Field Sampling *Year 1 Months 1 and 2*	event	2	$978	$1,956	Sampling Events per 'Monitoring Assumptions' (above): • 2-person crew. Techs at $30 per hour; 1 8-hr working day each for each of the Months 1 and 2 Events. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). Incidental expenses, shipping, and sampling/H&S equipment and expendables ($300/event).
4.3	Analytical *Year 1 Months 1 and 2*	event	2	$1,310	$2,620	Two Sampling Events per 'Monitoring Assumptions' (above): • 3 samples (including duplicates) per event by EPA TO-15 modified. Data management labor at $60/hr. 6 hrs/event. Data validation labor at $70/hr. 2 hrs/event.
4.4	Field Sampling *Year 1 Quarterly*	event	4	$2,296	$9,184	Sampling Events per 'Monitoring Assumptions' (above): • 2-person crew. Techs at $30 per hour; 10 working hrs/day for 2 days per quarterly event. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). Incidental expenses, shipping, and sampling/H&S equipment and expendables ($700/event).
4.5	Analytical *Year 1 Quarterly*	event	4	$5,460	$21,840	Four Sampling Events per 'Monitoring Assumptions' (above): • 16 samples (including duplicates) per event by EPA TO-15 modified. Data management labor at $60/hr. 12 hrs/event. Data validation labor at $70/hr. 6 hrs/event.
4.4	Annual OM&M Report	each			$0	covered above with OM&M Report under Engineering Controls.
				Subtotal	**$41,360**	
				ALTERNATIVE 3 **TOTAL <u>OM&M</u> COST FOR <u>YEAR 1</u>**	**$187,466**	Note: Multipliers are applied to future costs on Table B-3c

Notes, Abbreviations, and References
APU - air purifying unit SSD - sub-slab depressurization unit TCRA - time-critical removal action NTCRA - non-TCRA
OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).

Table B-3e
ALTERNATIVE 3 - SVE CONTAINMENT SYSTEM, ENGINEERING CONTROLS, AND OM&M
BACKUP FOR FUTURE OM&M COST - YEARS 2-5
SITE 1 EE/CA, NWIRP BETHPAGE, NY

Assumptions for Year 2 and Years 3-5:
All OM&M site work performed locally.
O&M: 12 APUs and 6 SSDs during Year 2, only. SVE Containment System (12 SVE Wells and 12 SVPMs) for Years 2-5. Note: APUs and SSDs are shut down and removed after Year 2.
(a) O&M includes electricity and miscellaneous repairs. O&M labor performed during sampling events when possible.
(b) Quarterly HEPA filter replacement on APUs. GAC replacement for SSDs in Year 2 only.
(c) Quarterly O&M for SVE Containment System during Years 2-5.
Monitoring:
(a) Indoor air, ambient-outdoor air, and sub-slab samples are collected over 24 hours. SSD-stack-off-gas samples are collected over 30 minutes.
(b) Sampling events for Years 2-5 would occur annually in September.
(c) Air/gas sample analysis for CVOCs by EPA Method TO-15 modified. One duplicate sample collected per 10 samples. Four duplicates during Year 2 based on sample count/event (12+16+10=38) in (d), (e), and (f) below.
(d) Four houses with one APU each, only. Each event: One sample each for indoor air, sub-slab vapor, and ambient-outdoor air at each house. Total 3 samples per house = 12 samples/event.
(e) Four houses with one APU and one SSD each. Each event: One sample each for indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 4 samples per house = 16 samples/event.
(f) Two houses with two APUs and one SSD each. Each event: One sample each for basement-indoor air, living-space-indoor air, SSD-stack off-gas, sub-slab vapor, and ambient-outdoor air at each house. Total 5 samples per house = 10 samples/event.
(g) It is assumed that the five houses without APUs nor SSDs would not be sampled after Year 1.
(h) SVE Containment System - Semiannual sampling during Years 2-5. TO-15 modified (30-minute SUMMA) and one duplicate per 10 samples. In addition, collection of SVPM vacuum readings.
(i) SVE Containment System - Pre-GAC-treatment vapor, System Off-gas, SVE well off-gas samples semiannually. Therefore, 14 samples plus 2 duplicates semiannually during Years 2-5. Annual SVPM vacuum readings at variable depths.

	Item	Unit	Quantity	Unit Cost	Cost	Notes / Comments
1. Quarterly O&M of Offsite Engineering Controls (APUs & SSDs) - Year 2 only (shut down after Year 2)						
1.1	Project Management	month	12	$480	$5,760	$120 per hour; 4 hours/month. 12 months.
1.2	HEPA Filter replacement on APU	event	4	$2,296	$9,184	Four O&M Events during Year 2 • HEPA filter switch-outs on each of the 12 APUs (1 filter/APU). $120/HEPA filter ($1,440/event) • 2-person crew. Labor at $35 per hour; 10 working hours/day; ~1 hr labor per switch-out. Assume 8 filters per day. Therefore
1.3	Granular Activated Carbon replacement *None during Year 1*	event	1	$3,600	$3,600	Switch-out during Year 2 • GAC-cartridges switch-out on 6 SSDs (one set of cartridges per SSD). $600/GAC-cartridges (including disposal). Labor for GAC switch-out covered by HEPA filter switch-out labor.
1.4	Electricity for APUs and SSDs	Unit-Year	18	$400	$7,200	12 APUs and 6 SSDs to be powered. $400/year per APU or SSD unit.
1.5	Miscellaneous Parts and Repairs	each (annual)	1	$2,516	$2,516	• Assume $1,000/yr for parts & repairs as necessary. • Assume 2-person crew, 16 hours/yr per person ($35/hr), 2 days vehicle ($70/day/team), and 2 days per-diem ($64/person/day).
				Subtotal	**$28,260**	
2. Quarterly O&M of SVE Containment System - Each of Years 2-5						
2.1	Project Management	month	12	$960	$11,520	$120 per hour; 8 hours/month. 12 months.
2.2	Technician	month	4	$434	$1,736	Quarterly O&M Events during each of Years 2-5: system status and vacuum readings. 1 technician at $30/hr for one 10-hr day. Assume $2,000/yr for parts & repairs as necessary.
2.3	SVE vapor condensate disposal	Annual	1	$2,058	$2,058	Dispose approximately 500 gallons SVE vapor condensate per year. Including labor, waste characterization, and nonhazardous disposal.
2.4	Electricity for SVE Containment System	Annual	1	$6,000	$6,000	SVE Blower system and miscellaneous electronics (e.g., heating and lighting) - $6000/year based on $0.208/Kw-hr (LIPA, March 2009)
2.5	Miscellaneous Parts and Repairs	Annual	1	$500	$500	• Assume $500/yr for parts & repairs as necessary. Labor covered above.
				Subtotal	**$21,814**	
3. Monitoring of Offsite Engineering Controls (APUs and SSDs) - Year 2 only (shut down after Year 2)						
3.1	Project Management	month	12	$480	$5,760	$120 per hour; 4 hours/month. 12 months.
3.2	Field Sampling *September 2011*	event	1	$9,286	$9,286	Year 2 Sampling Event per 'Monitoring Assumptions' (above): • 2-person crew. Labor at $35 per hour; 10 working hours/day. Sample 6-8 residences/wk. Therefore, just over 1 week (7 days / 70 hrs) per person per event. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). Incidental expenses, shipping, and sampling/H&S equipment and expendables ($3,000/event).
3.3	Analytical	event	1	$14,380	$14,380	Year 2 Sampling Event per 'Monitoring Assumptions' (above): • 42 samples (including duplicates) during Year 2 Sampling Event by EPA TO-15 modified. Data management labor at $60/hr. 32 hrs/event. Data validation labor at $70/hr. 16 hrs/event.
3.4	Annual OM&M Report	each	1	$18,000	$18,000	Data presentation, evaluation, and recommendations. Draft and Final. Includes labor and ODCs.
				Subtotal	**$47,426**	
4. Monitoring of SVE Containment System - Each of Years 2-5						
4.1	Project Management	month	12	$480	$5,760	$120 per hour; 4 hours/month. 12 months.
4.2	Field Sampling *semiannually*	event	2	$2,296	$4,592	Sampling Events per 'Monitoring Assumptions' (above): • 2-person crew. Techs at $30 per hour; 10 working hrs/day for 2 days per quarterly event. • Travel: Per diem ($64/person/day) and vehicle ($70/team/day). Incidental expenses, shipping, and sampling/H&S equipment and expendables ($700/event).
4.3	Analytical *semiannually*	event	2	$5,460	$10,920	Four Sampling Events per 'Monitoring Assumptions' (above): • 16 samples (including duplicates) per event by EPA TO-15 modified. Data management labor at $60/hr. 12 hrs/event. Data validation labor at $70/hr. 6 hrs/event.
4.4	Annual OM&M Report	Annual			$0	covered above with OM&M Report under Engineering Controls.
				Subtotal	**$21,272**	
				ALTERNATIVE 3 **TOTAL OM&M COST FOR YEAR 2**	**$118,772**	Note: Multipliers are applied to future costs on Table B-3c
				ALTERNATIVE 3 **TOTAL ANNUAL OM&M COST FOR EACH OF YEARS 3-5**	**$54,942**	APUs and SSDs shut down and removed after Year 2. Add 25% of Offsite Monitoring cost per year for additional SVE performance monitoring in residential area. Note: Multipliers are applied to future costs on Table B-3c

Notes, Abbreviations, and References
APU - air purifying unit SSD - sub-slab depressurization unit TCRA - time-critical removal action NTCRA - non-TCRA
OM&M and Periodic Costs - operation and maintenance (O&M) and monitoring (OM&M) occurs after Year 0 construction (i.e., implementation) to ensure the effectiveness of the action. Periodic costs include Five-Year Reviews, system shutdown and demobilization, etc. (EPA, 2000).